

# Floods of May-June 1948 in Columbia River Basin

*Prepared under the direction of C. G. PAULSEN, Chief Hydraulic Engineer*

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GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1080

*A presentation of data on  
floods, gathered from selected  
gaging stations and other sources*

*With a section on  
Magnitude and Frequency of Floods  
By S. E. RANTZ and H. C. RIGGS*

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# CONTENTS

	Page
Abstract.....	1
Introductions.....	1
Administration and personnel.....	3
Acknowledgments.....	4
General description of the floods.....	5
Flood damage.....	13
Meteorologic and hydrologic conditions.....	15
Meteorology [prepared by staff of United States Weather Bureau]	15
Precipitation.....	21
Temperature.....	27
Determination of flood discharges.....	37
Stages and discharges at stream-gaging stations.....	37
Explanation of data.....	37
Columbia River main stem.....	46
Columbia River at Nicholson, British Columbia.....	46
Columbia River at Revelstoke, British Columbia.....	47
Columbia River at Birchbank, British Columbia.....	48
Columbia River at international boundary.....	49
Franklin D. Roosevelt Lake at Grand Coulee Dam, Wash.....	50
Columbia River at Grand Coulee Dam, Wash.....	51
Columbia River at Trinidad, Wash.....	53
Columbia River near The Dalles, Oreg.....	54
Kootenai River Basin.....	55
Kootenay River at Canal Flats, British Columbia.....	55
Kootenay River at Wardner, British Columbia.....	56
Kootenay River at Newgate, British Columbia.....	57
Kootenai River at Libby, Mont.....	58
Kootenai River at Leonia, Idaho.....	59
Kootenai River at Boom Camp, near Bonners Ferry, Idaho.....	60
Kootenai River at Bonners Ferry, Idaho.....	61
Kootenai River near Bonners Ferry, Idaho.....	63
Kootenai River at Klockman Ranch, near Bonners Ferry, Idaho.....	64
Kootenai River near Copeland, Idaho.....	65
Kootenai River at Porthill, Idaho.....	66
Kootenay Lake at Kuskonook, British Columbia.....	67
Fortine Creek near Trego, Mont.....	68
Lake Creek near Troy, Mont.....	69
Boulder Creek near Leonia, Idaho.....	70
Moyie River at Eastport, Idaho.....	71
Moyie River at Eileen, Idaho.....	72
Deep Creek at Moravia, Idaho.....	73
Long Canyon Creek near Porthill, Idaho.....	74
Smith Creek near Porthill, Idaho.....	75
Boundary Creek near Porthill, Idaho.....	76
Slocan River at Crescent Valley, British Columbia.....	77
Pend Oreille River Basin.....	78
Clark Fork above Missoula, Mont.....	78
Clark Fork below Missoula, Mont.....	79
Clark Fork at Tarkio, Mont.....	80
Clark Fork at St. Regis, Mont.....	81
Clark Fork near Plains, Mont.....	82
Clark Fork near Heron, Mont.....	83
Pend Oreille Lake at Hope, Idaho.....	84
Pend Oreille River below Z Canyon, near Metaline Falls, Wash.....	85
Smaller reservoirs in Pend Oreille River Basin, Mont.....	86
Flint Creek near Southern Cross, Mont.....	90
Flint Creek at Maxville, Mont.....	91
Flint Creek near Maxville, Mont.....	92
Flint Creek near Drummond, Mont.....	92
Trout Creek above main canal, near Philipsburg, Mont.....	93
Trout Creek near Southern Cross, Mont.....	94
Boulder Creek at Maxville, Mont.....	95
Willow Creek near Hall, Mont.....	96
Middle Fork Rock Creek near Philipsburg, Mont.....	97
Blackfoot River near Helmsville, Mont.....	98
Blackfoot River near Ovando, Mont.....	99
Blackfoot River near Bonner, Mont.....	100
Nevada Creek above reservoir, near Finn, Mont.....	101
Nevada Creek near Helmsville, Mont.....	102
West Fork Bitterroot River near Conner, Mont.....	103
Bitterroot River near Darby, Mont.....	104
East Fork Bitterroot River at Conner, Mont.....	105
Rock Creek near Darby, Mont.....	106
Rock Creek Canal near Darby, Mont.....	106
Blodgett Creek near Corvallis, Mont.....	107
Bear Creek near Victor, Mont.....	109
Burnt Fork Creek near Stevensville, Mont.....	110
Flathead River at Flathead, British Columbia.....	111
Flathead River near Columbia Falls, Mont.....	112
Flathead River at Columbia Falls, Mont.....	113
Flathead Lake at Somers, Mont.....	114
Flathead River near Polson, Mont.....	115
Middle Fork Flathead River at Essex, Mont.....	116
Middle Fork Flathead River near Belton, Mont.....	117
Bear Creek near Essex, Mont.....	118
Skyland Creek near Essex, Mont.....	119

## Stages and discharges at stream-gaging stations--Continued.

	Page
Pend Oreille River Basin--Continued.	
South Fork Flathead River near Columbia Falls, Mont.	120
Stillwater River near Whitefish, Mont.	121
Whitefish Creek near Kalispell, Mont.	122
Ashley Creek near Kalispell, Mont.	123
Swan River near Big Fork, Mont.	124
Priest Lake at outlet, near Coolin, Idaho.	125
Priest River at outlet of Priest Lake, near Coolin, Idaho.	126
Priest River near Priest River, Idaho.	127
Kettle River Basin.	128
Kettle River near Ferry, Wash.	128
Kettle River near Laurier, Wash.	129
Colville River Basin.	130
Colville River at Kettle Falls, Wash.	130
Mill Creek near Colville, Wash.	131
Spokane River Basin.	132
Coeur d'Alene River near Prichard, Idaho.	132
Coeur d'Alene River at Enaville, Idaho.	133
Coeur d'Alene River near Cataldo, Idaho.	134
Coeur d'Alene Lake at Coeur d'Alene, Idaho.	135
Spokane River at Post Falls, Idaho.	136
Spokane River at Spokane, Wash.	137
Spokane River at Long Lake, Wash.	138
St. Joe River at Calder, Idaho.	139
St. Maries River at Lotus, Idaho.	140
Hayden Creek near Hayden Lake, Idaho.	141
Hayden Lake at Hayden Lake, Idaho.	141
Latah Creek at Spokane, Wash.	142
Little Spokane River near Dartford, Wash.	143
Okanogan River Basin.	144
Osoyoos Lake near Oroville, Wash.	144
Okanogan River at Oroville, Wash.	145
Okanogan River near Tonasket, Wash.	146
Similkameen River near Nighthawk, Wash.	147
Methow River Basin.	148
Methow River at Twisp, Wash.	148
Chelan River Basin.	149
Stehekin River at Stehekin, Wash.	149
Lake Chelan at Chelan, Wash.	150
Chelan River at Chelan, Wash.	151
Railroad Creek at Lucerne, Wash.	152
Wenatchee River Basin.	152
Wenatchee Lake near Plain, Wash.	152
Wenatchee River below Wenatchee Lake, Wash.	153
Wenatchee River at Plain, Wash.	154
Wenatchee River at Peshastin, Wash.	155
Chiwawa River near Plain, Wash.	156
Icicle Creek above Snow Creek, near Leavenworth, Wash.	157
Crab Creek Basin.	158
Crab Creek at Irby, Wash.	158
Crab Creek near Moses Lake, Wash.	159
Crab Creek near Warden, Wash.	159
Crab Creek near Smyrna, Wash.	160
Park Creek below Park Lake, near Coulee City, Wash.	161
Rocky Ford Creek near Ephrata, Wash.	161
Moses Lake at Moses Lake, Wash.	162
Park Lake near Coulee City, Wash.	162
Blue Lake near Coulee City, Wash.	162
Lenore Lake near Soap Lake, Wash.	162
Soap Lake near Soap Lake, Wash.	162
Yakima River Basin.	163
Keechelus Lake near Martin, Wash.	163
Yakima River near Martin, Wash.	164
Yakima River at Cle Elum, Wash.	165
Yakima River at Umtanum, Wash.	166
Yakima River near Parker, Wash.	167
Yakima River at Kiona, Wash.	168
Kachess Lake near Easton, Wash.	169
Kachess River near Easton, Wash.	170
Cle Elum Lake near Roslyn, Wash.	172
Cle Elum River near Roslyn, Wash.	173
Teanaway River near Cle Elum, Wash.	175
Naches River below Tieton River, near Naches, Wash.	176
Bumping Lake near Nile, Wash.	177
Bumping River near Nile, Wash.	177
American River near Nile, Wash.	179
Tieton Reservoir near Naches, Wash.	180
Tieton River at Tieton Dam, near Naches, Wash.	181
Tieton River at headworks of Tieton Canal, near Naches, Wash.	182
North Fork Ahtanum Creek near Tampico, Wash.	183
South Fork Ahtanum Creek at Conrad Ranch, near Tampico, Wash.	184
Snake River Basin.	185
Snake River main stem.	185
Snake River at Weiser, Idaho.	185
Snake River at Oxbow, Oreg.	186
Snake River near Clarkston, Wash.	187
Payette River Basin.	189
Payette River near Payette, Idaho.	189
Burnt River Basin.	190
Burnt River near Hereford, Oreg.	190
Powder River Basin.	191
Powder River at Salisbury, Oreg.	191



## Stages and discharges at stream-gaging stations--Continued.

Snake River Basin--Continued.	
Powder River Basin--Continued.	Page
Powder River near Haines, Oreg.	192
Powder River near Robinette, Oreg.	193
Wolf Creek near North Powder, Oreg.	194
Imnaha River Basin.	195
Imnaha River above Gumboot Creek, Oreg.	195
Imnaha River at Imnaha, Oreg.	196
Salmon River Basin.	197
Salmon River near Obsidian, Idaho.	197
Salmon River below Valley Creek, at Stanley, Idaho.	198
Salmon River below Yankee Fork, near Clayton, Idaho.	199
Salmon River near Challis, Idaho.	200
Salmon River at Salmon, Idaho.	201
Salmon River near Shoup, Idaho.	202
Salmon River near French Creek, Idaho.	203
Salmon River at Whitebird, Idaho.	204
Alturas Lake Creek near Obsidian, Idaho.	205
Valley Creek at Stanley, Idaho.	206
Yankee Fork Salmon River near Clayton, Idaho.	207
Challis Creek near Challis, Idaho.	208
Panther Creek near Shoup, Idaho.	209
Middle Fork Salmon River near Cape Horn, Idaho.	210
Bear Valley Creek near Cape Horn, Idaho.	211
Big Creek near Big Creek, Idaho.	212
South Fork Salmon River near Knox, Idaho.	213
Johnson Creek near Landmark ranger station, Idaho.	214
Johnson Creek at Yellow Pine, Idaho.	215
Secesh River near Burgdorf, Idaho.	217
Warren Creek near Warren, Idaho.	218
Mud Creek near Tamarack, Idaho.	219
Grande Ronde River Basin.	220
Grande Ronde River near Hilgard, Oreg.	220
Grande Ronde River at La Grande, Oreg.	221
Grande Ronde River at Rondowa, Oreg.	222
Grande Ronde River at Troy, Oreg.	223
Catherine Creek near Union, Oreg.	224
Indian Creek near Imbler, Oreg.	225
East Fork Wallowa River near Joseph, Oreg.	226
Wallowa Falls power-plant tailrace near Joseph, Oreg.	226
Hurricane Creek near Joseph, Oreg.	227
Lostine River near Lostine, Oreg.	228
Bear Creek near Wallowa, Oreg.	229
Asotin Creek Basin.	230
Asotin Creek near Asotin, Wash.	230
Clearwater River Basin.	231
Selway River above Meadow Creek, near Lowell, Idaho.	231
Selway River near Lowell, Idaho.	232
Clearwater River at Kamiah, Idaho.	233
Clearwater River at Spalding, Idaho.	234
Lochsa River near Lowell, Idaho.	235
South Fork Clearwater River near Elk City, Idaho.	236
South Fork Clearwater River near Grangeville, Idaho.	237
North Fork Clearwater River at Bungalow ranger station, Idaho.	238
North Fork Clearwater River near Ahsahka, Idaho.	239
Potlatch Creek at Kendrick, Idaho.	240
Walla Walla River Basin.	241
South Fork Walla Walla River near Milton, Oreg.	241
North Fork Walla Walla River near Milton, Oreg.	242
Mill Creek near Walla Walla, Wash.	243
Mill Creek at Walla Walla, Wash.	244
Blue Creek near Walla Walla, Wash.	244
Yellowhawk Creek at Walla Walla, Wash.	245
Garrison Creek at Walla Walla, Wash.	245
East Fork Touchet River near Dayton, Wash.	246
Touchet River near Touchet, Wash.	247
Umatilla River Basin.	248
Umatilla River above Meacham Creek, near Gibbon, Oreg.	248
Umatilla River at Pendleton, Oreg.	249
Umatilla River at Yoakum, Oreg.	250
Umatilla River near Umatilla, Oreg.	251
McKay Creek near Pilot Rock, Oreg.	252
McKay Creek near Pendleton, Oreg.	253
Birch Creek at Rieth, Oreg.	254
Butter Creek near Pine City, Oreg.	255
John Day River Basin.	256
John Day River at Prairie City, Oreg.	256
John Day River at Picture Gorge, near Dayville, Oreg.	257
John Day River at Service Creek, Oreg.	258
John Day River at McDonald Ferry, Oreg.	259
Strawberry Creek above Slide Creek, near Prairie City, Oreg.	260
North Fork John Day River near Dale, Oreg.	261
North Fork John Day River at Monument, Oreg.	262
Camas Creek near Ukiah, Oreg.	263
Middle Fork John Day River at Ritter, Oreg.	264
Fox Creek at gorge, near Fox, Oreg.	265
Deschutes River Basin.	266
Deschutes River at Moody, near Biggs, Oreg.	266
Klickitat River Basin.	267
Klickitat River near Pitt, Wash.	267
Hood River Basin.	267
Hood River near Hood River, Oreg.	267

Stages and discharges at stream-gaging stations--Continued.	Page
White Salmon River Basin.....	268
White Salmon River near Underwood, Wash.....	268
Little White Salmon River Basin.....	268
Little White Salmon River at Willard, Wash.....	268
Wind River Basin.....	269
Wind River near Carson, Wash.....	269
Sandy River Basin.....	269
Sandy River below Bull Run River, near Bull Run, Oreg.....	269
Washougal River Basin.....	270
Washougal River near Washougal, Wash.....	270
Willamette River Basin.....	270
Willamette River at Salem, Oreg.....	270
Willamette River at Portland, Oreg.....	270
Mill Creek at Salem, Oreg.....	271
South Yamhill River, near Whiteson, Oreg.....	271
North Yamhill River near Pike, Oreg.....	272
Mollalla River near Canby, Oreg.....	272
Pudding River near Aurora, Oreg.....	273
Tualatin River near Willamette, Oreg.....	273
Clackamas River near Cazadero, Oreg.....	274
Johnson Creek at Sycamore, Oreg.....	274
Lewis River Basin.....	275
Lewis River at Ardel, Wash.....	275
East Fork Lewis River near Heisson, Wash.....	275
Kalama River Basin.....	276
Kalama River below Italian Creek, near Kalama, Wash.....	276
Cowlitz River Basin.....	276
Cowlitz River at Castle Rock, Wash.....	276
Elokomia River Basin.....	277
Elokomia River at Castle Rock, Wash.....	277
Younge River Basin.....	277
Younge River near Astoria, Oreg.....	277
Summary of flood stages and discharges.....	278
Flood-crest stages.....	306
Stage relations, Columbia River near international boundary.....	315
Magnitude and frequency of floods in the Columbia River Basin, by S. E. Rantz and H. C. Riggs.....	317
Abstract.....	317
Introduction.....	317
Administration and acknowledgments.....	318
Physical features of the basin.....	318
Characteristics of floods in Columbia River Basin.....	322
Methods of analysis.....	326
Plotting positions.....	327
Annual-flood method.....	328
Partial-duration-series method.....	328
Comparison of annual-flood and partial-duration-series methods.....	329
Probable error of a flood-frequency graph.....	350
The enveloping curve.....	351
Flood magnitude and frequencies.....	353
Columbia River main stem.....	355
Columbia River at Kettle Falls, Wash.....	355
Columbia River near The Dalles, Oreg.....	356
Kootenai River Basin.....	358
Kootenai River at Libby, Mont.....	358
Kootenai River at Leonia, Idaho.....	342
Kootenai River at Bonners Ferry, Idaho.....	344
Boulder Creek near Leonia, Idaho.....	346
Moyie River at Eileen, Idaho.....	349
Deep Creek at Moravia, Idaho.....	352
Smith Creek near Porthill, Idaho.....	354
Boundary Creek near Porthill, Idaho.....	357
Pend Oreille River Basin.....	360
Clark Fork above Missoula, Mont.....	360
Clark Fork below Missoula, Mont.....	362
Clark Fork at St. Regis, Mont.....	364
Clark Fork near Plains, Mont.....	368
Pend Oreille River below Z Canyon, near Metaline Falls, Wash.....	370
Flathead River near Columbia Falls, Mont.....	372
Flathead River at Columbia Falls, Mont.....	374
Flathead River near Polson, Mont.....	377
Middle Fork Flathead River at Belton, Mont.....	378
South Fork Flathead River near Columbia Falls, Mont.....	381
Whitefish Creek near Kalispell, Mont.....	383
Swan River near Big Fork, Mont.....	385
Priest River at outlet of Priest Lake, near Coolin, Idaho.....	387
Kettle River Basin.....	389
Kettle River near Ferry, Wash.....	389
Kettle River near Laurier, Wash.....	392
Colville River Basin.....	394
Colville River at Kettle Falls, Wash.....	394
Spokane River Basin.....	397
Coeur d'Alene River near Cataldo, Idaho.....	397
Spokane River at Post Falls, Idaho.....	401
Spokane River at Spokane, Wash.....	402
St. Joe River at Calder, Idaho.....	403
Okanogan River Basin.....	407
Okanogan River near Tonasket, Wash.....	407
Similkameen River near Nighthawk, Wash.....	409

Flood magnitude and frequencies--Continued.		Page
Methow River Basin.....		413
Methow River at Twisp, Wash.....		413
Chelan River Basin.....		415
Stehekin River at Stehekin, Wash.....		415
Railroad Creek at Lucerne, Wash.....		419
Wenatchee River Basin.....		422
Wenatchee River at Plain, Wash.....		422
Yakima River Basin.....		426
North Fork Ahtanum Creek near Tampico, Wash.....		426
Snake River Basin.....		428
Snake River near Clarkston, Wash.....		428
South Fork Boise River near Lenox, Idaho.....		431
Malheur River near Drewsey, Oreg.....		435
Salmon River below Yankee Fork, near Clayton, Idaho.....		437
Salmon River at Whitebird, Idaho.....		440
Grande Ronde River at Rondowa, Oreg.....		442
Clearwater River at Kamiah, Idaho.....		445
Umatilla River Basin.....		449
Umatilla River near Umatilla, Oreg.....		449
John Day River Basin.....		452
John Day River at McDonald Ferry, Oreg.....		452
Deschutes River Basin.....		456
Deschutes River at Moody, near Biggs, Oreg.....		456
White River below Tygh Valley, Oreg.....		459
Klickitat River Basin.....		463
Klickitat River near Glenwood, Wash.....		463
Cowlitz River Basin.....		466
Cowlitz River at Castle Rock, Wash.....		466
List of references.....		469
Index.....		471

## ILLUSTRATIONS

	Page
Plate 1. Flood scenes at Vanport, Oreg., on Columbia River.....	2
2. Flood scenes at Vanport, Oreg., was being flooded.....	3
3. Flood scenes in Portland, Oreg., on Willamette River.....	10
4. A, United States Coast Guard rescuing stranded family on Sauvie's Island in Columbia River about 20 miles northwest of Portland, Oreg.; B, Fruit Valley Homes, housing project near Vancouver, Wash.....	16
5. Maps of Columbia River Basin, showing total precipitation during the periods October 1 to May 31, 1893-94 and 1947-48.....	26
6. Map of Columbia River Basin, showing location of flood determinations.....	In pocket
7. A, Cofferdam at McNary dam site overtopped by Columbia River; B, Grande Ronde River at lower end of State ditch, looking southwest.....	54
8. A, Break in dike along Kootenai River in Idaho through which reclamation district No. 5 was flooded; B, Break in dike along Kootenai River near Bonners Ferry.....	62
9. A, Bonners Ferry, Idaho, flooded by Kootenai River; B, Bridge of the United States Forest Service over Long Canyon Creek near Porthill, Idaho.....	63
10. Flood scenes on Clark Fork in Montana.....	82
11. A, Bridge over Methow River near Carlton, Wash.; B, Building damaged by Entiat River about 5 miles above mouth.....	148
12. A, Clearwater River at Kamiah, Idaho; B, Flood damage on Whitebird Creek near Whitebird, Idaho.....	234
Figure 1. Map showing location of area covered by this report.....	2
2. Maximum annual floods of Columbia River at The Dalles, Oreg.....	6
3. Graphs of stage and discharge for the floods of 1894 and 1948 at various stream-gaging stations in Columbia River Basin.....	8
4. Map showing air-flow pattern and air temperatures ("F.") at 850 millibars (about 5,000 feet altitude), 7 p.m. May 1, 1948.....	17
5. Map showing air-flow pattern and air temperatures ("F.") at 850 millibars (about 5,000 feet altitude), 7 p.m. May 27, 1948.....	18
6. Chart showing air temperatures at an altitude of 5,000 feet, at Spokane, Wash., May 1 to June 15, 1948.....	19
7. Chart showing air temperatures at an altitude of 5,000 feet at Boise, Idaho, May 1 to June 15, 1948.....	20
8. Isohyetal map of Columbia River Basin showing total precipitation, in inches, May 16-31, 1948.....	23
9. Daily precipitation at various precipitation stations of the United States Weather Bureau in Idaho and of the Meteorological Service, Dominion of Canada, in British Columbia, January 1 to June 30, 1948..	24
10. Daily precipitation at various precipitation stations of the United States Weather Bureau in Oregon, Washington, and Montana, January 1 to June 30, 1948.....	25
11. Map of Columbia River Basin showing depth, in inches, of water content of snow on the ground about April 1, 1948.....	27
12. Cumulative monthly precipitation for various precipitation stations of the United States Weather Bureau for October 1 to June 30, 1893-94 and 1947-48.....	28

	Page
Figure 13. Daily range of temperature and accumulated departure of mean monthly temperature from normal at various temperature stations of the United States Weather Bureau and the Meteorological Service, Dominion of Canada, in Columbia River Basin, January 1 to June 30, 1948.....	36
14. Daily range of temperatures at various temperature stations of the United States Weather Bureau in Columbia River Basin, April 1 to June 30, 1894 and 1948.....	38
15. Graphs of mean daily discharge at various river-measurement stations in Kootenai and Pend Oreille River Basins, May 1 to July 31, 1948.....	41
16. Graphs of mean daily discharge at various river-measurement stations in upper Columbia River Basin, May 1 to July 31, 1948.....	42
17. Graphs of mean daily discharge at various river-measurement stations in Snake and lower Columbia River Basins, May 1 to July 31, 1948.....	43
18. Graphs of mean daily discharge at various river-measurement stations on Columbia River, May 1 to July 31, 1948.....	44
19. Maximum discharges, in second-feet per square mile, for various areas in Columbia River Basin, May-June 1948, as given in table 3.....	279
20. Curves comparing stages of Columbia River near international boundary before and after completion of Little Dalles excavation and Grand Coulee Dam.....	316
21. Graphs of mean daily discharge for year of high runoff at river-measurement stations on Snake, Boise, and Deschutes Rivers.....	319
22. Graphs of mean daily discharge for year of high runoff at river-measurement stations on Columbia, Kootenai, and Swan Rivers.....	320
23. Graphs of mean daily discharge for year of high runoff at river-measurement stations on St. Joe River and Boulder Creek.....	321
24. Graphs of discharge of various floods at different river-measurement stations in Columbia River Basin.....	325
25. Annual-flood frequency graph for Columbia River near The Dalles, Oreg., showing use of Gumbel diagram.....	329
26. Flood-frequency graph for Swan River near Big Fork, Mont., showing probable limits of variation.....	331
27. Maximum discharges, in second-feet per square mile, of various floods for different areas in Columbia River Basin.....	332

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TABLES

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	Page
Table 1. Preliminary estimate of flood damage.....	13
2. Equivalent depth of water, in inches, determined by snow surveys about April 1.....	29
3. Summary of flood stages and discharges.....	280
4. Flood crest stages.....	307

## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

### ABSTRACT

The flood of May-June 1948 in the Columbia River Basin was the greatest in the basin since the historic flood of 1894 and the most disastrous in respect to monetary loss in the history of the basin. Loss of life was relatively small when considered in the light of the extensive damage and destruction to homes and other property. Outstanding features of the flood were its magnitude in the large streams and the long duration of peak or near-peak stages.

The flood was caused by a combination of conditions conducive to the production of high runoff. Cold wet weather prevailed until mid-May. Snow surveys showed that the mountain snow pack, already above normal, increased in water content during April and early May. After May 15 temperatures over the basin rose sharply and continued to be abnormally high.

Few discharge records in the basin are continuous since 1894. However, available records of discharge and heights of former floods indicate that on the main stem of the Columbia and on the principal tributaries above The Dalles, Oreg., the flood of 1948 was the greatest since 1894. Streams in the upper Snake River Basin were not abnormally high, owing to a relatively light snow pack in the area. Willamette River made little contribution in discharge to the flood on the lower Columbia, although the Willamette near the mouth was raised by the Columbia. On many smaller tributaries in other parts of the basin the peak discharges of 1948 have been exceeded more recently than 1894, as high unit rates of discharge on small streams, especially those at low altitudes, are more likely to result from intense local rains than from snow melt.

Notable high rates of discharge largely from snow melt were 35.1 second-feet per square mile from 1,330 square miles in Methow River in Washington, 27.4 second-feet per square mile from 1,640 square miles in South Fork Flathead River in Montana, and 18.5 second-feet per square mile from 9,570 square miles in Clearwater River in Idaho.

As soon as the magnitude of the flood became evident, prompt action was taken by the Congress in granting an appropriation to the Interior Department in general for the restoration of facilities damaged or destroyed by the flood. To supplement the existing stream-gaging program, an allotment from this appropriation was made to the Geological Survey for preparation of a flood report and rehabilitation of gaging stations damaged by the flood. The Geological Survey thereby was enabled to take prompt steps towards collecting information relating to the flood and to plan the preparation of a flood report.

This report presents records of stage and discharge for the period including the flood at about 230 stream-gaging stations, records of storage in many reservoirs, a summary of peak discharges with comparative data for floods at about 490 measurement points, and tables showing crest stages along an aggregate length of stream channel for 657 miles.

The report also includes a discussion of weather associated with the flood, a discussion of snow as a factor in producing the flood, tables showing water content of snow prior to the flood period, and other data pertinent to the flood.

Following the main flood report is a brief report entitled, "Magnitude and Frequency of Floods in the Columbia River Basin," a study of recurrence intervals of floods of various magnitudes.

### INTRODUCTION

During the latter part of May and the early part of June 1948 the Columbia River Basin in the United States and Canada was ravaged by a flood that was the greatest in magnitude of discharge since 1894 and the most disastrous with respect to monetary losses in the history of the basin. At least 51 persons lost their lives, and property damage has been estimated to exceed 100 million dollars. Land inundated by the flood included about 250,000 acres of farm land, on which the growing crops were destroyed. More than 20,000 acres of land was damaged or destroyed by erosion. Destruction of the community of Vanport at Portland, Oreg., left nearly 19,000 persons homeless and took the lives of at least 16. (See pls. 1, 2.)

The United States Geological Survey, operating through several district offices, maintains nearly 600 river-measurement stations within the Columbia River Basin in the United States, as a part of the regular Nation-wide stream-gaging program for the investigation of the water resources of the Nation. These stations have been maintained by the Geological Survey largely in cooperation with states, municipalities, and other Federal agencies. Many have been operated for continuous periods of such length that systematic records of stages, discharges, and volumes of flow covering the range from drought to extraordinary flood are available.

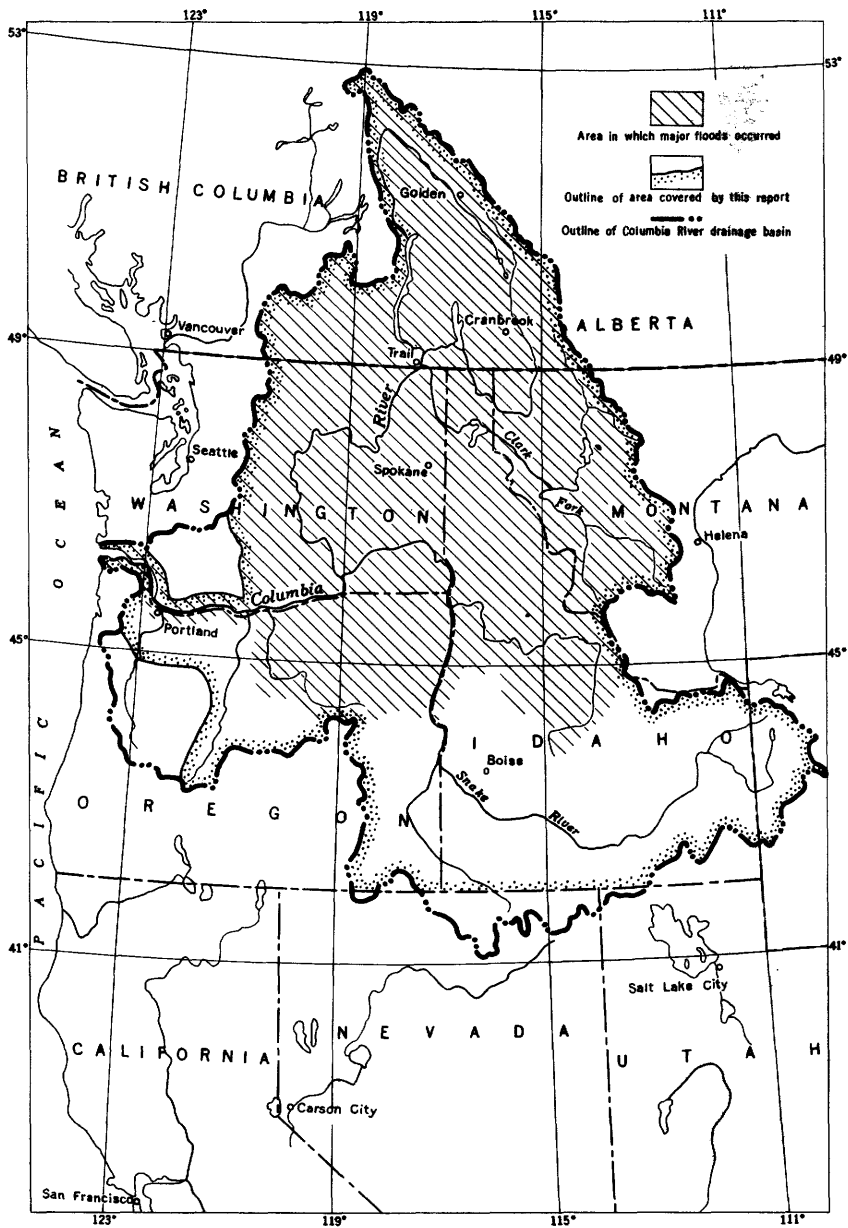


Figure 1.--Map showing location of area covered by this report.



A. BREAK IN RAILROAD FILL THROUGH WHICH VANPORT WAS FLOODED.

Courtesy of The Oregonian.



B. VANPORT AFTER BEING FLOODED.

Courtesy of Les T. Ordeman, Oregon Journal.

FLOOD SCENES AT VANPORT, OREG., ON COLUMBIA RIVER.



**A. AUTOMOBILES BEING REMOVED FROM VANPORT AS FLOODWATERS RISE.**  
Courtesy of Mel Junghans, Oregon Journal.



**B. RESCUE OPERATIONS IN VANPORT AS WATER RISES.**  
Courtesy of The Oregonian.

**FLOOD SCENES AS VANPORT, OREG., WAS BEING FLOODED.**



Similarly the Dominion Water and Power Bureau, Department of Mines and Resources, Dominion of Canada, operates and maintains river-measurement stations in the Columbia River Basin in Canada. Many of the stations at or near the boundary between the two countries are operated by the two agencies under a formal diplomatic arrangement designed to make the records equally available and acceptable to users in the two countries.

Flood data have been collected in this report for both the United States and Canadian parts of the basin because of the importance of the Columbia River as an international stream and particularly because of the special usefulness of the data in studies currently being made of the development of the water resources of the basin by the International Joint Commission, the United States, and Canada.

As soon as the magnitude of the flood became apparent, immediate action was taken to collect and compile all available data concerning the maximum stages and discharges of streams throughout the flooded area. It was necessary that field work be started promptly in order that all possible data could be collected before they were obliterated by processes of reconstruction, vegetal growth, or weathering. The work of the Geological Survey was done as a part of the current program for the investigation of the water resources, supplemented by \$95,000 allocated to the Geological Survey for the preparation of this report from an appropriation of \$2,000,000 made by the Congress to the Department of the Interior for repair of flood damage to facilities of the Interior Department in the Columbia River Basin.

The cost of printing the report was borne by funds appropriated to the Department of State and transferred to the Geological Survey for technical investigations relative to matters under study by the International Joint Commission.

The first published figures of stages and discharges during the flood were contained in a supplement to the May issue and in the June issue of the Water Resources Review - United States and Canada, prepared by the Geological Survey and released for distribution on June 10 and July 8, 1948, respectively. A preliminary report in more detail was released for distribution in September 1948.

This volume presents the records of stages and discharges of rivers in the Columbia River Basin during the floods of May and June 1948, discussions of the meteorologic and hydrologic aspects, and other information related to the flood.

Figure 1 shows the area covered by this report and the areas in which flooding was most severe.

An independent report is presented on pages 317-469 entitled, "Magnitude and frequency of floods in the Columbia River Basin," by S. E. Rantz and H. C. Riggs, hydraulic engineers of the Geological Survey. This report was prepared in the main as a part of the Columbia River Basin studies in progress under the International Joint Commission.

#### ADMINISTRATION AND PERSONNEL

This report was prepared by the water resources division of the Geological Survey under the general administrative supervision of C. G. Paulsen, chief hydraulic engineer.

The field work and the collection and tabulation of the basic information relating to stages and discharges for all except the Canadian portion of the basin were performed by the district engineers and their staffs in the surface water branch, J. V. B. Wells, chief. The district engineers responsible for collection and preparation of this infor-

mation were F. M. Veatch, Tacoma, Wash.; G. H. Canfield, Portland, Oreg., succeeded by K. N. Phillips; T. R. Newell, Boise, Idaho; Lynn Crandall, Idaho Falls, Idaho; and A. H. Tuttle, Helena, Mont. Valuable assistance in performing the field and office work was given by engineers detailed from other parts of the United States. The work was coordinated in the field by C. C. McDonald, district engineer, water utilization branch, Tacoma, Wash., and Hollister Johnson, hydraulic engineer, surface water branch.

All data for the Canadian portion of the basin were furnished by C. E. Webb, district chief engineer, and his staff, of the Dominion Water and Power Bureau, Victor Meek, controller.

The report was given final review and was assembled for publication in the special reports section, G. C. Stevens, chief, by C. D. Bue, hydraulic engineer, assisted by D. L. Milliken, hydraulic engineer on detail to the special reports section.

#### ACKNOWLEDGMENTS

The Geological Survey, acting through its district field offices, cooperates with state, municipal, and Federal agencies in the several districts. Acknowledgment is made of the participation of the cooperating agencies in the collection of the systematic records of river discharge that form the broad base on which the specific flood information has been placed.

The information in this report has been obtained from many sources, including individuals, corporations, and governmental organizations - local, state, and Federal. Financial cooperation in connection with the regular river-measurement program of the Geological Survey in the areas covered by this report has been received from the following state and local agencies: in Oregon, the office of State Engineer; in Washington, the State Department of Conservation and Development, Columbia County, and Walla Walla County Planning Commission; in Idaho, the Idaho Department of Reclamation; and in Montana, the office of State Engineer and the State Water Conservation Board.

Federal agencies in the United States to whom acknowledgments are made for financial assistance, services rendered, or data furnished include the Corps of Engineers, the Bureau of Reclamation, the Department of State, the Office of Indian Affairs, the Weather Bureau, the Forest Service, and the Soil Conservation Service.

Assistance in collecting records was also rendered by North Side Canal Co., Board of Control for Boise Project, Crane Creek Reservoir Administration Board, Lake Irrigation District, Salmon River Canal Co., Idaho Power Co., Oakley Canal Co., city of Pocatello, watermasters for Snake, Weiser, Big Lost, Big Wood, Boise, and Lake Fork Payette Rivers, Montana Power Co., Portland General Electric Co., Pacific Power and Light Co., Eastern Oregon Land Co., California-Pacific Utilities Co., Washington Water Power Co., and Puget Sound Power and Light Co. So far as practicable, acknowledgments for individual contributions of information are given at appropriate places in the report.

The International Columbia River Engineering Board rendered valuable assistance in enlisting the cooperation and participation of other agencies, particularly those in Canada.

Records for stations in Canada other than those designated as international gaging stations and other information for the Canadian portion of the basin were furnished by the Dominion Water and Power Bureau, Department of Mines and Resources, Canada.

## GENERAL DESCRIPTION OF THE FLOODS

The flood of May-June 1948 in the Columbia River Basin had its immediate cause in a sequence of temperatures conducive to production of a flood from snow melt. During April and the early part of May temperatures had been subnormal, so that melting of the snows in the high mountains was delayed. Snow surveys showed that the mountain snow pack, already above normal, contraseasonally increased in water content during April and early May. The last surveys of the season, made about May 1, showed water contents greatly above normal for that date. Snow-survey records indicate that the water content for that date may have exceeded 200 percent of normal in some areas. On May 16 temperatures rose generally to an unusual amount above normal in the upper basin and remained abnormally high. During the week ending May 25 precipitation totals of 2 to 3 inches were recorded in the area between Grand Coulee Dam, Wash., and Kalispell, Mont. Conditions were favorable for a major flood.

Possible flood hazard was recognized as early as March 1, and by May 1 runoff of damaging proportions was considered almost a certainty. "Water supply forecasts for the Columbia Basin," issued as of May 1 by the United States Weather Bureau, is quoted in part: "By and large, April precipitation over the Columbia Basin was unusually large, and runoff forecasts have been modified upwards very considerably over most of the area..... The Clark Fork-Pend Oreille, Spokane, and Clearwater Basins are forecast to have very large runoffs exceeding in places the maxima of record..... Flood hazards have increased on the Clark Fork-Pend Oreille, the Spokane and its tributaries, the Clearwater, the Kootenai, and the main stem of the Columbia River. Suitable precautions should be taken against flooding, seepages, and damage to irrigation works along these streams."

"Federal-state cooperative snow surveys and irrigation water forecasts for Columbia Basin," issued as of May 1 by the Soil Conservation Service, is quoted in part: "Retarded snow melt and above-normal precipitation during April will increase the amount and rate of runoff throughout the northern and western parts of the Columbia River Basin. The outlook a month ago in these areas for greater than normal runoff with possible flood hazard has changed to certainty of runoff of flood proportions with attendant damage in vulnerable areas..... Flood hazard exists on the stream in northern Idaho, western Montana, and in Washington. For the third consecutive year high water in Kootenai Valley at and below Bonners Ferry, Idaho, is expected..... Now it is possible that high [Kootenai] river stages will happen again, possibly higher than either of the past 2 years, and it is imperative that the situation be closely watched. More or less the same outlook for near maximum runoff and flood hazard holds for all the tributaries to Columbia River in northern Idaho, western Montana, Washington, and British Columbia..... Also, extra high water may be expected on all these streams during the latter part of May and in June. This same situation may also extend to lower Columbia River."

Available records indicate that the flood of 1948 was the greatest since 1894 on the large rivers of the basin, although on many smaller tributaries more recent floods have occurred, which were generally greater than that of 1948. This flood has been exceeded on the lower Columbia River during the last 100 years only by the floods of 1894 and 1876, and probably the flood of 1849. (See fig. 2.) The 1948 flood was of greatest severity in the Columbia River tributaries in northern Washington, in the Pend

FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

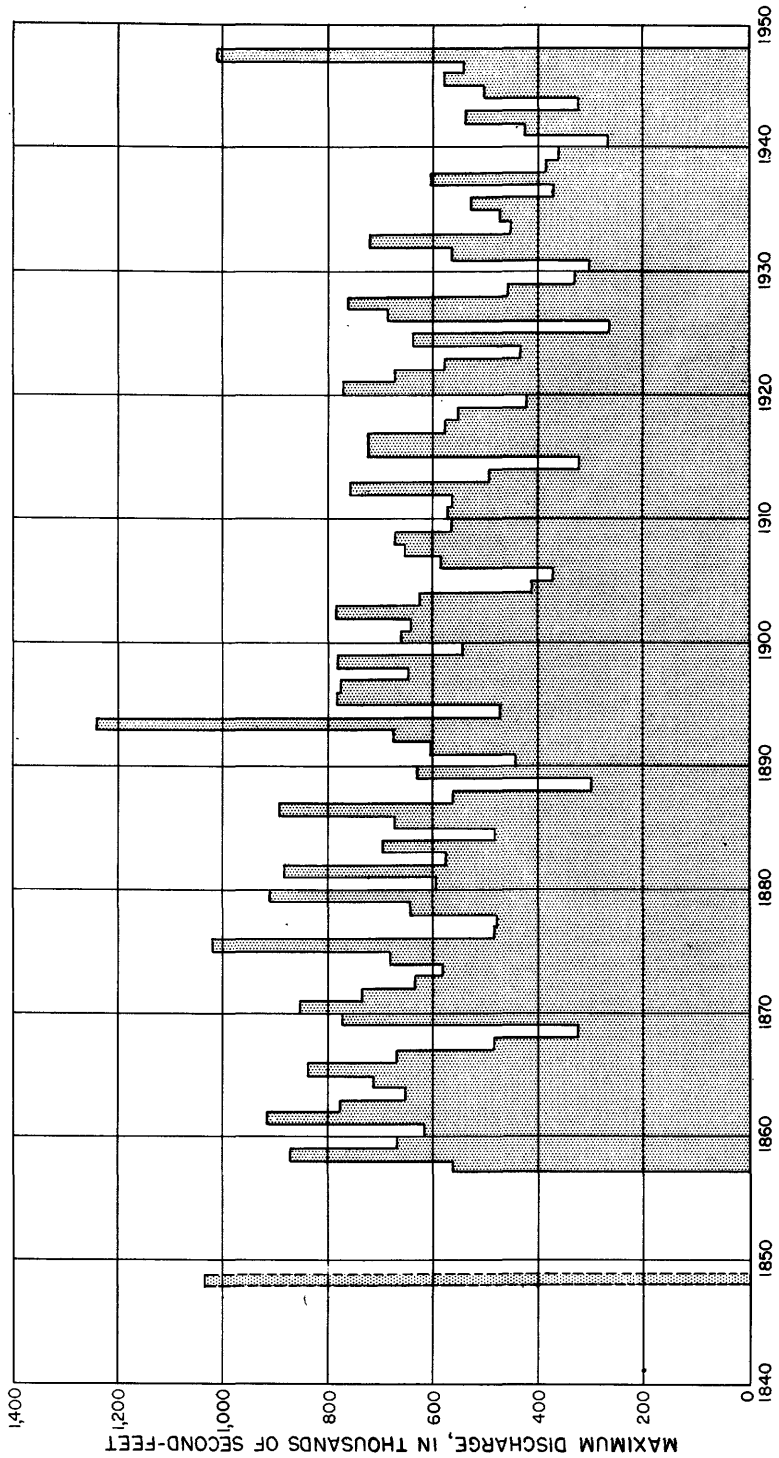


Figure 2.--Maximum annual floods of Columbia River at The Dalles, Oreg.

Oreille-Kootenai region, and in the lower Snake River tributaries. Peak flows were not unusually great in the upper Snake River Basin and in the tributaries to the Columbia River below Deschutes River.

Plates 1 to 4 and 7 to 12 illustrate conditions experienced on rivers in the Columbia River Basin during the floods of May-June 1948.

A critical feature of the flood was the long duration of peak or near-peak stages on the Columbia. (See fig. 3.) Willamette River at Portland, Oreg., backed up by the Columbia, reached peak stages of 29.95 feet on June 1 and 29.975 feet on June 14. The stage at Portland remained above 25 feet for 26 days, as compared with 29 days in 1894, and above flood stage of 18 feet for 43 days, as compared with 57 days in 1894. Columbia River near The Dalles, Oreg., reached a peak discharge of 1,010,000 second-feet on May 31. Discharge remained above 900,000 second-feet for 17 days, as compared with 24 days in 1894, and above 500,000 second-feet for 42 days, as compared with 65 days in 1894. Threatening stages were prolonged by heavy rains and continued high temperatures after the crest of the snow runoff had passed.

After May 15 above-normal temperatures prevailed, and headwater streams rose rapidly. On May 23 the first dike failure occurred along Kootenai River in Idaho. At Bonners Ferry the crest elevation of 1,778.32 feet was reached on May 28, a level 1.1 feet above the peak of the flood of 1894. As the discharge of the flood of 1948 was less than that of 1894, this increased flood level probably reflects the effect of river constriction by diking. Since 1894, and mostly within the past 25 years, the normal flood plain of Kootenai River between Bonners Ferry and Kootenay Lake has been diked off and reclaimed for agriculture. On the basis of studies by the Geological Survey, it is estimated that the crest of 1948 in Idaho would have been at least 1 to 2 feet higher except for the effect of channel excavation made in recent years below Nelson, British Columbia. Depths of water in Bonners Ferry ranged from 18 inches on sidewalks of the main street to eaves of houses in the lower areas. The city's water system failed on account of a broken main caused by the flood, and the sewerage system was not operating for several days. Power, telephone, and telegraphic services were practically uninterrupted. An official of the Great Northern Railway reported 7 or 8 miles of main line track under water in the Kootenai area. Several highways in the vicinity of Bonners Ferry were closed. About 40,000 acres of diked land was flooded, causing severe damage to growing crops. Upstream in Montana the Kootenai flooded basements in the business districts of Libby and Troy, and about 60 families were forced to leave their homes.

In Montana warm weather and heavy rains produced peak flows as early as May 23 on Flathead River and Clark Fork. A minor recession occurred, followed by another general peak on tributary streams about May 28. About 40 families were evacuated along Flathead River in the Kalispell area, and more than 1,500 acres of farm land was flooded. Flooding of farm land was general along Clark Fork between Missoula and the Montana-Idaho State line. Extensive flooding of low-lying land occurred along Bitterroot River, where in the upper reaches stages were exceeded by those of May 1947. In parts of Flathead River Basin the stages of 1948 were exceeded by those of 1928 and 1933.

Flooding occurred along Clark Fork in Idaho, with the peak discharge near the mouth (at Pend Oreille Lake) occurring on May 31. The town of Sandpoint, situated on Pend Oreille Lake near its outlet into Pend Oreille River, underwent considerable damage from

FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

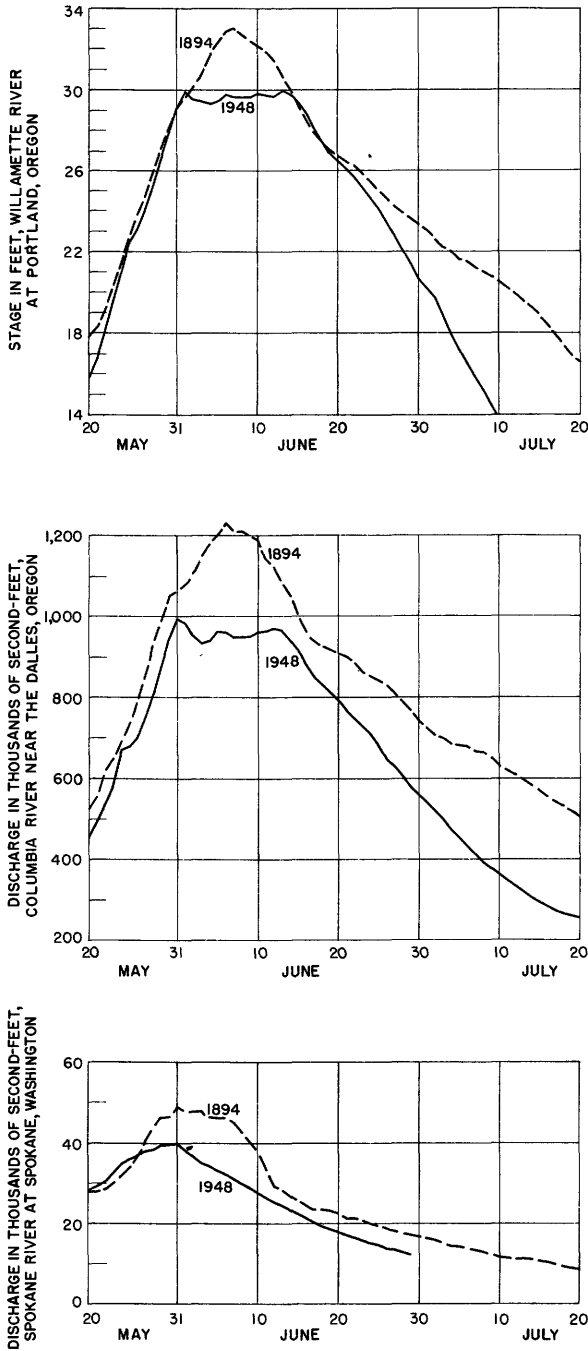


Figure 3.--Graphs of stage and discharge for the floods of 1894 and 1948 at various stream-gaging stations in Columbia River Basin.

inundation. In Spokane River Basin in Idaho some farm land was flooded, and damage to forest roads and bridges is reported to have been especially severe. Highway communication along St. Joe River was cut off, but railway service was not interrupted. St. Joe River reached its peak on May 28 at a discharge substantially below those of December 1933 and April 1938.

On May 31 Pend Oreille River flooded 12,000 acres around Cusick and Usk, Wash., and forced 600 residents to leave their homes when dikes were dynamited. The primary state highway to Metaline Falls was inundated in several places, and a bridge over Tacoma Creek near Usk was washed out.

Owing to regulation and diversion and a relatively light snow pack in the upper headwaters, the contribution from the upper Snake River was small in proportion to the area drained. However, heavy contributions were made by Salmon and Clearwater Rivers, and low-lying areas of several towns in the Clearwater Basin were flooded. Considerable damage was done to Forest Service roads and trails.

Considerable damage occurred in Grande Ronde River Valley in eastern Oregon during the latter part of May. On May 23 Catherine Creek, a tributary to Grande Ronde River, overflowed its banks and flooded part of the town of Union. For several subsequent days Union was flooded by overflow from Catherine and Little Creeks, which continued to rise until about May 27 or 28.

Severe damage occurred along Methow River in Washington. The towns of Twisp, Methow, and Winthrop were isolated, and six state highway bridges were destroyed or rendered unusable. Sections of highway were washed out, and many orchards and homes were completely destroyed. Eleven weeks elapsed before the main highway was opened to traffic. Okanogan River flooded parts of the towns of Omak and Okanogan, and many residents were evacuated. Salmon Creek, tributary to Okanogan River, overflowed and ran down the main street of Conconully. About half of the houses in town were damaged, the outlet highway was closed, and one man was drowned. It is of interest to note that the same town underwent greater destruction in 1894, when on May 27, according to newspaper accounts, a cloudburst in the headwaters of Salmon Creek sent a wall of water 8 to 12 feet high through Conconully, washing away every one of the 125 buildings except the hotel and post office, and drowning 1 person.

By May 27 Columbia River had overflowed its banks at Hanford, Wash., and 5,000 persons were evacuated. On May 28 the shipyards at Washougal, Camas, Vancouver, and Ridgefield were shut down, and the Camas-Washougal port was under 5 feet of water. On May 29 the Columbia River Highway was closed between The Dalles and Cascade Locks in Oregon, and 1,400 persons were evacuated near Vancouver, Wash.

The greatest single disaster of the flood occurred at Vanport, Oreg., when a railroad fill serving as a dike broke at 4:15 p.m. on Sunday, May 30. A wall of water poured through the breach with such rapidity that few of the 18,700 residents escaped with more than the clothing they were wearing. Within an hour the town was completely destroyed. According to most recent reports at least 16 persons lost their lives. The disaster occurred on a Sunday afternoon, the middle of a 3-day holiday, when many people were absent or were using the holiday to move out of danger; had the disaster occurred at night on a work day the loss of life might have mounted to thousands. Because the area was surrounded by dikes it became a placid lake after it filled with water. Houses that had not been demolished by the first onrushing wave floated in 10 to 15 feet of water. Hundreds of volunteer workers, policemen, Red Cross workers, national guardsmen,

soldiers, and sheriff's deputies searched the wreckage for bodies. The search was expedited by the use of war-developed amphibious vehicles. Sixty-five Portland elementary schools were converted into emergency shelters for the evacuees.

At The Dalles, Oreg., the river broke through a levee at about 6 a.m. on May 30, flooding the lower section of the town. The crest reached The Dalles at 6:30 p.m. on May 31.

As the flood crest moved downstream, the Corps of Engineers on June 1 ordered mass evacuation from areas along both sides of the lower Columbia River below Portland, Oreg. Downstream from Portland, floodwaters of Lewis River, backed up by the Columbia, threatened the town of Woodland, Wash., with a disaster similar to that which befell Vanport. By the night of June 1 the residents of all the threatened areas in the lower valley had been evacuated. On June 2 dikes failed in Woodland, and water stood 2 to 8 feet deep in the business district. Because of the foresight in evacuating the residential areas no lives were lost.

Willamette River at Portland, backed up by the Columbia, reached a stage of 29.95 feet on June 1 from 11 a.m. to noon and then began to recede slowly, only to renew its threat as the upper river in British Columbia and Snake and Pend Oreille Rivers began to rise again. A second crest of 29.975 feet, as observed by Portland Harbor Patrol, occurred from 2 to 4 a.m. on June 14. During the period between crests, and for many days thereafter, the river remained a menace. The Corps of Engineers ordered suspension of river traffic below Portland, as waves caused by boats might break through dikes already nearly overtopped and softened by days of high stage. Thousands of engineer troops and volunteer workers labored unceasingly to save the dikes along the lower river.

The runoff from Willamette River was not abnormally high during the flood period. On June 1 Willamette River was discharging about 34,000 second-feet at its mouth; however, it was backed up by Columbia River, and the Union Station in Portland stood in quiet backwater. (See pl. 3.)

The following description of the flood in Canada was furnished by C. E. Webb, district chief engineer, Dominion Water and Power Bureau, Vancouver, British Columbia:

"Flood damage was general throughout the Province of British Columbia during May and June of 1948, as the rivers rose to their highest levels since 1894. Thirty thousand civilians and 3,500 Air Force, Army, and Navy personnel battled to save the dykes. As the flood waters receded, 20,000 persons were displaced from their homes, and property damage amounted to \$18,000,000.

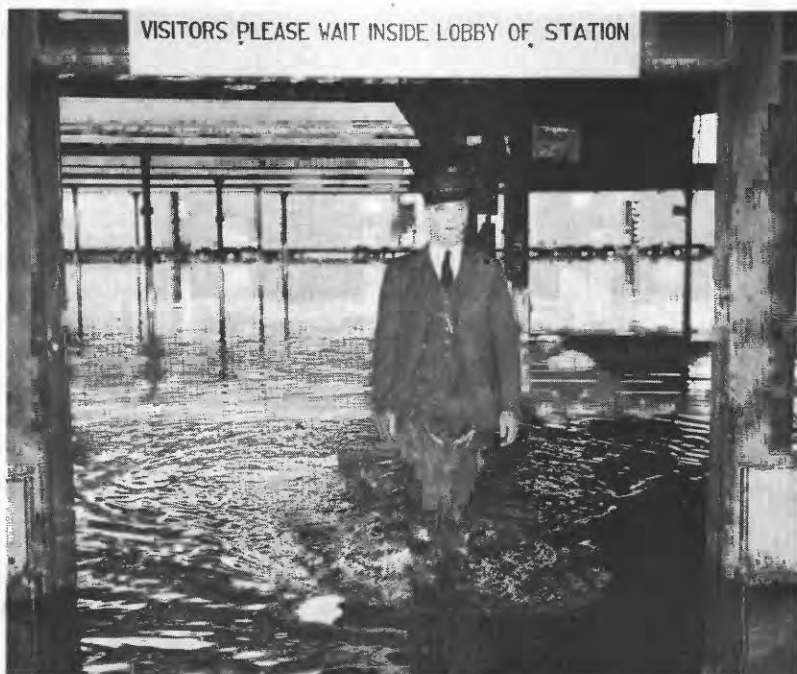
"In the Skeena, Columbia, and Fraser Basins rivers rose to extreme heights, washing out highways and railroads in many localities, disrupting transportation and communication. The city of Fernie [on Elk River in Kootenay Basin] was isolated for several weeks, while waters of Mark Creek [Kootenay Basin] flowed through the heart of the city of Kimberley, destroying a considerable portion of the business section, as well as residential areas. The lower part of the city of Trail [on main stem of Columbia] was inundated. Some 15,000 acres of highly productive land in the Kootenay Valley in the vicinity of Creston was flooded.

"The Fraser River Basin, particularly in its lower reaches, was probably the hardest hit section of the Province. Fifty thousand acres of fruit and berry lands were flooded. The city of Vancouver was virtually isolated for approximately 3 weeks as railways were washed out and telegraph and telephone services were disrupted. The air lines were Vancouver's only outside connection until service was resumed on Canadian transcontinental railways."





A. UNION STATION.  
Courtesy of The Oregonian.



B. INSIDE UNION STATION.  
Courtesy of Herb Alden, Oregon Journal.

FLOOD SCENES IN PORTLAND, OREG., ON WILLAMETTE RIVER.



Flash cloudburst floods occurred in several localities, adding to the damage caused by the general flood. On May 28 a flash flood from Iron Springs Creek at Ephrata, in east-central Washington, flooded the downtown area and left 3 feet of mud and water in the county courthouse. On the same day, a flash flood from Gorge Gulch and Canyon Creek sent water 2 feet deep through the town of Burke, Idaho, leaving only two houses undamaged.

Severe local storms began in the late afternoon of June 9 and continued intermittently for several days in Gilliam, Morrow, Wheeler, and Umatilla Counties--the heart of the wheat belt of northeastern Oregon--resulting in damage to growing grain and destruction of ferries, livestock, roads, and bridges. Several homes were flooded, 20 miles of logging railroad was damaged, and two lives were lost. According to available reports the most concentrated of these storms occurred in the basins of Black Horse, Butter, and Thirtymile Creeks. Determinations of discharge were made at two points in Butter Creek Basin, where a cloudburst occurred on June 9. Computation by the slope-area method indicates discharges of 3,580 and 3,700 second-feet per square mile from two washes with drainage areas of 0.33 and 1.41 square miles, respectively. The latter discharge is equivalent to a runoff rate of nearly 6 inches per hour.

A disturbance crossed eastern Washington on June 10, causing intense storms in several localities. At Richland, Wash., high winds caused waves of such height on the still high Columbia River that the dikes were threatened. Officials of the atomic energy plant sent out urgent appeals for help, and 100,000 sand bags and other equipment were brought in by plane. Power and telephone lines were broken down around Sunnyside, Wash., by the heavy winds and torrential rains. This same storm hit near Harrington, Wash., and sent 5 feet of water sweeping over the main highway. Later in the evening another cloudburst in the same locality delayed train traffic for about 6 hours. Pine Canyon Creek near Waterville, Wash., rushed down Pine Canyon and destroyed several miles of paved highway. A slope-area measurement indicated a discharge from South Fork Pine Canyon Creek of 4,630 second-feet per square mile from a drainage area of 5.4 square miles.

Flash floods occurred on Moses Creek in Washington about May 20 and on June 10. It is difficult to say which flood was the more destructive, although the second was the greater in discharge. According to Mr. William R. Van Dersal, acting regional conservator, Soil Conservation Service, it was "one of the worst flash floods of record.... Several miles of track and many bridges were destroyed on a branch line of the Great Northern Railway. One life was lost. There was considerable damage to county roads and bridges, farm property, etc..." The second flood was caused by the same storm that caused the flood in Pine Canyon Creek. The reported rainfall for June 11 at Waterville, which is practically on the divide between Moses and Pine Canyon Creeks, was 2.79 inches. According to local residents, the greater part of this rain fell early in the evening of June 10.

Damage to highways and railroads was widespread. Many bridges were destroyed or damaged, and several major structures were declared unsafe during the flood period. Railroad service was suspended in many communities when railroads were washed out or rendered unsafe. Although local train service in the vicinity of Portland, Oreg., was suspended during the flood, train service was maintained with minor delays between Portland and points south by the Southern Pacific Company and between Portland and points

east by the Union Pacific Railroad Company through the use of a temporary east-side terminal in Portland.

No serious power shortages resulted during the flood, except for temporary disruption of service in some areas due either to the flood or to lightning. The output at Bonneville and Grand Coulee plants was diminished by lessening of head due to high river stages. On the other hand, flood conditions caused curtailment in loads as a result of closing down of some of the industrial plants that were flooded or threatened with flooding. Power was made widely available through regional integrated operation of the power system, so that the curtailment in demand for power tended to offset the reduction in power output.

Telephone communication was disrupted in several areas when telephone lines were blown down by high winds or damaged by the flood. On June 2 the cable of the Pacific Telephone and Telegraph Co. across the Columbia River broke between Portland and Vancouver.

Communication and transportation facilities in the national forests were disrupted to such an extent that the Forest Service would have been greatly handicapped in fighting a serious forest fire had one occurred during the flood period. Fortunately, the general precipitation and high humidity that prevailed greatly reduced the severity of fires.

Radio station KPDQ, Portland, was flooded off the air. Station KPQ, Wenatchee, Wash., maintained its schedule by using floating transmitters on five large life rafts. Daily stage forecasts were broadcast by the United States Weather Bureau at Portland. Amateur radio operators set up emergency communication networks in several flooded areas.

The Portland airport and the adjacent military airport, just northeast of Portland, were inundated during the flood. On May 30 the Portland airport was closed because of flood hazard. On May 31 evacuation of the field was ordered by the Corps of Engineers, as only the dike of Multnomah County drainage district protected the airports from the water that flooded Vanport. On June 11 the dike broke at a point where the district's pump house was built within the dike, about 2 miles west of the airports. Attempts to close the breach were unsuccessful. The released water spread over an area of at least 10,000 acres, completely covering both airports. At the crest of the flood water stood 8 to 10 feet deep at the main passenger buildings and offices. The Portland airport was out of service from May 30 to September 3; use of the airport was not resumed by all regular airlines until about September 9.

Property adjacent to the airports was also flooded, including some small factories and food-processing plants, many homes, and most of the Alderwood, Broadmoor, Colwood, and Riverside golf courses. There was no widespread destruction of buildings as at Vanport. The water rose slowly, and current was not perceptible after the peak was reached.

One of the hazards of the flood was the threat to public health through contamination of water supply. Residents in all flooded areas were advised to boil their drinking water, and portable chlorinators were used in some areas. Vaccination for typhoid fever was made available in many communities affected by the flood. Prompt measures were taken by the Red Cross and local health officers to forestall outbreak of epidemic disease, and none occurred. No serious food shortages were reported.

## FLOOD DAMAGE

At least 51 lives were lost as a result of the flood. House Document 308 Review Report, prepared by the Corps of Engineers as of October 1, 1948, based on a survey made immediately after the flood, states that 50 lives were lost. One more body was found subsequently at Vanport. Loss of life at Vanport was at least 16.

The Red Cross reported the following figures: 712 homes destroyed, including 490 Government-Owned buildings at Vanport containing 6,809 dwelling units; 4,482 homes damaged; 38,500 persons made homeless; 53,495 persons given emergency care; and 9,190 families registered as assisted by the Red Cross. The number of persons represented as being given emergency care were those in Red Cross shelters and in homes of friends and relatives that were known to the Red Cross. The number of families represented as being assisted by the Red Cross were those who received rehabilitation assistance and who may or may not have received emergency care. According to the Oregon Journal for December 26, 1948, the Red Cross spent nearly \$3,500,000 for flood relief from Yakima, Wash., to Astoria, Oreg. and reckoned the disaster as the greatest since the Ohio and Mississippi flood in 1937.

Immediately after the flood, surveys of flood damage were begun by the Corps of Engineers, Department of Agriculture, and various state and county agencies and other organizations. Field surveys of damage have been largely completed, but final figures are not yet available. Figures of flood damage available for inclusion in this report are preliminary estimates.

The tabulation of flood damage by basins, presented in table 1, was abstracted from the report of the division engineer of the North Pacific Division, Corps of Engineers, as contained in House Document 308 Review Report.

Table 1.- Preliminary estimate of flood damage  
[From table II-19, House Document 308 Review Report]

Location	Acreage inundated	Flood damage
Clark Fork.....	89,000	\$4,380,000
Kootenai River.....	44,000	5,792,000
Spokane River.....	26,000	848,000
Okanogan River.....	28,000	2,000,000
Yakima River.....	21,000	2,435,000
Other tributaries above Yakima River.....	8,000	4,172,000
Salmon River, Idaho.....	18,000	250,000
Clearwater River, Idaho.....	27,000	2,282,000
Snake River tributaries above Weiser.....	3,000	200,000
Grande Ronde River.....	22,000	875,000
Snake River, main stem.....	27,000	350,000
John Day River.....	15,000	175,000
Columbia River:		
Grand Coulee Dam to Yakima River.....	3,000	150,000
Yakima River to Vancouver, north shore.....	57,000	1,475,000
Vancouver to Baker Bay, north shore.....	71,000	18,670,000
Snake River to Sandy River, south shore.....	30,000	1,940,000
Sandy River to Willamette River, south shore.....	16,000	38,796,000
Backwater, Willamette River (Portland and vicinity)	5,000	10,275,000
Willamette River to Youngs Bay, south shore.....	72,000	7,660,000
	582,000	\$102,725,000

Little information is at hand regarding direct losses incurred by industries.

Damage to the Diamond Match Co.'s mill in the vicinity of Cusick, Wash., was estimated at \$300,000. Several shipyards along the Columbia were closed, although the extent of flood damage is not yet known. Six Federal fish hatcheries reported heavy damage to buildings, holding ponds, and water-supply facilities.

The Corps of Engineers estimated that 582,000 acres of land was inundated during the flood. An item in the July 22, 1948, issue of the Engineering News-Record stated

that more than 150,000 acres of diked lands, including both agricultural and industrialized areas, were saved from inundation by dikes. Another item in the July 1, 1948, issue of the same publication stated that the Corps of Engineers had saved the \$43,000,000 aluminum plant at Troutdale, Oreg., by dumping 29,000 cubic yards of gravel across Columbia River Slough near Portland.

The Department of Agriculture estimated physical damage to land as follows: about 250,000 acres of farm land inundated, resulting in loss of growing crops in addition to damage to improvements; 4,250 acres of land lost through stream-bank erosion, and an additional 19,000 acres damaged by deposition; and 161 million tons of top soil washed away. As an indication of the extent of movement of silt and debris, the flood deposited about 120,000 cubic yards of sand, silt, and rock in The Dalles-Celilo Canal.

Damages in national forests have been estimated by the United States Forest Service to be \$6,368,300. Two regions, of three, reported physical damage to about 2,500 miles of roads, about 7,000 miles of trails, and about 300 bridges.

The following figures were taken from the report of a survey of flood damage in Washington made by the Washington National Guard: damaged or destroyed -- 4,471 homes and 21 cabins, 2,083 farm structures, 387 business structures, 117 industrial properties, 21 public buildings, 11 water systems, 2 power systems, 87 bridges, and more than 700 miles of road. Loss and damage to crops and pasture was estimated as about \$8,000,000. Total community loss was estimated as \$43,675,490.

Actual losses in Oregon through flooding of farm land have been estimated as \$3,061,500 by the Oregon State College Extension Service, and an additional \$2,926,000 has been estimated as the value of potential losses for 1948 and 1949. Crops on 22,550 acres were destroyed by inundation. The assistant State highway engineer of Oregon furnished an estimated figure of \$492,000 as the amount of damage to State highways in Oregon, of which \$380,000 represents damage in the vicinity of Portland.

About 40,000 acres of diked land in the Kootenai River Basin was flooded. Damages were estimated at \$15,000,000. Estimated crop loss included more than 1,000,000 bushels of wheat.

Break-down of losses to all railroads is not available at this time, but reports from railroad companies in the basin indicate that their losses may have been about \$5,000,000. Probably the greatest single item of damage was the wash-out of track and many bridges of the Mansfield branch of the Great Northern Railway along Moses Creek east of Wenatchee, Wash., as the result of a cloudburst. The cost of rebuilding this line has been estimated at about \$1,000,000.

The Pacific Telephone & Telegraph Co. reported that major damage to long-distance lines occurred at Vanport and at The Dalles. About 2,700 telephone stations and about 60,000 feet of cable, varying in size from 11 to 600 pairs, were put out of service. About 2,700 feet of buried cable was destroyed at Portland Airport, and a 9-position switchboard with equipment was destroyed at Vanport.

Portland General Electric Co. reported outages on the overhead system as follows: 5.8 miles of 57,000-volt lines, 15 days; 13.0 miles of 11,000-volt lines, 1 to 4 months; and 35.0 miles of smaller lines, 5 days to 4 months. Considerable damage to underground cables was reported. The general superintendent stated that "an immense amount of preparatory work was done in anticipation of the flood by plugging duct lines and installing

temporary pumps." These precautions doubtless prevented much greater damage.

The Western Union Telegraph Co. reported loss of two minor cables in Portland. Service was operative during the entire flood period except possibly for brief interruption of some minor service.

Damage caused by the intense storm on June 9 in the basins of Black Horse and Butter Creeks in eastern Oregon was estimated at \$35,900 by the United States Soil Conservation Service. Several severe local storms occurred in the basin of Thirtymile Creek in eastern Oregon during the period June 9-15. On June 10 two persons were drowned in a small tributary of Thirtymile Creek. Damage in this basin as a result of these storms was estimated at "well over half a million" dollars by the Condon [Oreg.] Globe-Times of June 18.

The total flood damage in 1948 in the part of the Columbia River Basin in the United States was estimated as nearly \$103,000,000 by the Corps of Engineers. Damages in British Columbia including the Fraser River Basin was about \$18,000,000, according to a report by C. E. Webb, district chief engineer, Dominion Water and Power Bureau, Vancouver, British Columbia.

The historic flood of 1894 was higher than the flood of 1948 by 3.0 feet at Portland and by 7.8 feet at The Dalles. An article in the Tacoma [Wash.] Daily Ledger for June 10, 1894, stated that the damage in the Northwest was conservatively estimated to be \$5,200,000, of which \$2,800,000 was in damage to railroads. It was noted that the greater part of this loss occurred below the mouth of Snake River. The railroads were rebuilt on higher ground insofar as possible, which minimized their losses in the flood of 1948. However, as the basin developed, it has been the tendency for communities to encroach on the flood plains of the rivers (see pl. 4); hence the loss of homes and other property was high in 1948. It has been estimated by the Corps of Engineers that a recurrence of a flood of the magnitude of the flood of 1894 would cause damage amounting to more than \$350,000,000. Greater floods than that of 1948 have swept through the Columbia River Basin in the past; greater floods--or at least the conditions to produce them--will probably recur in the future.

#### METEOROLOGIC AND HYDROLOGIC CONDITIONS

##### Meteorology

Prepared by the staff of the United States Weather Bureau

The Columbia River Basin lies in a climatic region meteorologically dominated by the Aleutian low and the Pacific high. One result is that precipitation in this basin, as along the rest of the west coast of the United States, is practically confined to the period from October to June. Over the basin the maximum monthly average occurs in December. The dominating centers of action, with mean positions at about latitudes 55° and 35°, respectively, exhibit an annual migration associated with the march of solar altitude, centering farthest north in summer and farthest south in winter. Accompanying this migration, with the seasonal variation in contrast between land and sea temperatures providing a major cause, is the growth in intensity and extent of the Aleutian low in winter and the simultaneous weakening of the Pacific high. The basin thus comes within the Aleutian low's circulation at the time of its greatest extent and intensity, with the result that the basin is then exposed to frequent cyclonic and frontal passages imbedded in a prevailing eastward or northeastward current of maritime air. The Coast and Cascade Ranges, intercepting

these currents, intensify precipitation along their windward slopes, while elsewhere the normally lower intensities may be increased by temporary variations in such factors as carry-over, direction of flow, frontal passages, and instability. Because of the comparatively steep lapse rates in the cool maritime air the precipitation falls as snow at the moderate elevations characterizing the basin, the snowfall normally accumulating till late spring. The typical Columbia River flood results from the melting in late spring of the snow pack thus accumulated in the colder months. Rains concurrent with the thaw may augment the flood but are seldom more than a minor contribution.

By April of 1948 the precipitation accumulated since October was in general above normal, as the result of unusually frequent cyclonic passages over the region, with snow pack also above normal on account of prevailing low temperatures. The magnitude of the flood that followed, however, depended to a large extent on the weather of the subsequent months. The critical period was approximately from the middle of April to the middle of June. This period can be divided into two parts, both with above-normal precipitation, but the first half, mid-April to mid-May, had below-normal temperatures, while the second half, mid-May to mid-June, had above-normal temperatures. The two parts of the critical period were so consistently different in character that the differences appear clearly even in mean flow patterns such as those of the mean charts for 700 millibars (approximately 10,000 feet) regularly prepared by the Extended Forecast Section of the Weather Bureau.

The chart for the cold half of the critical period, mid-April to mid-May, showed air being brought to the basin from about latitude  $60^{\circ}$ , although its normal trajectory is from about latitude  $40^{\circ}$ . Though the air entered the basin from the west and southwest, it had been brought only a short distance cyclonically around a low-pressure center in the Gulf of Alaska. It was thus not only cold but had the short trajectory over water characterizing the most unstable maritime polar air. Heavier-than-normal precipitation was produced when the air was lifted by the north-south mountain ridges of the basin, with resulting precipitation mostly in the form of snow because of the low temperatures.

The mean map for the warm half of the critical period, mid-May to mid-June, showed a marked change in flow pattern. A low was established off northern California and a high-pressure ridge over midcontinent. Between them there was a flow from the south directly over the basin from latitudes  $25^{\circ}$ - $30^{\circ}$  instead of the usual latitudes  $35^{\circ}$ - $40^{\circ}$ . The air from so far south was warm and moist, experiencing a cyclonic flow which increased its instability and favored shower and thunderstorm activity. The air was thus in such a condition that even a small amount of lift or insolation heating would cause it to rise to high elevations, cool to condensation, and precipitate--now as rain rather than snow because of the accompanying high temperatures.

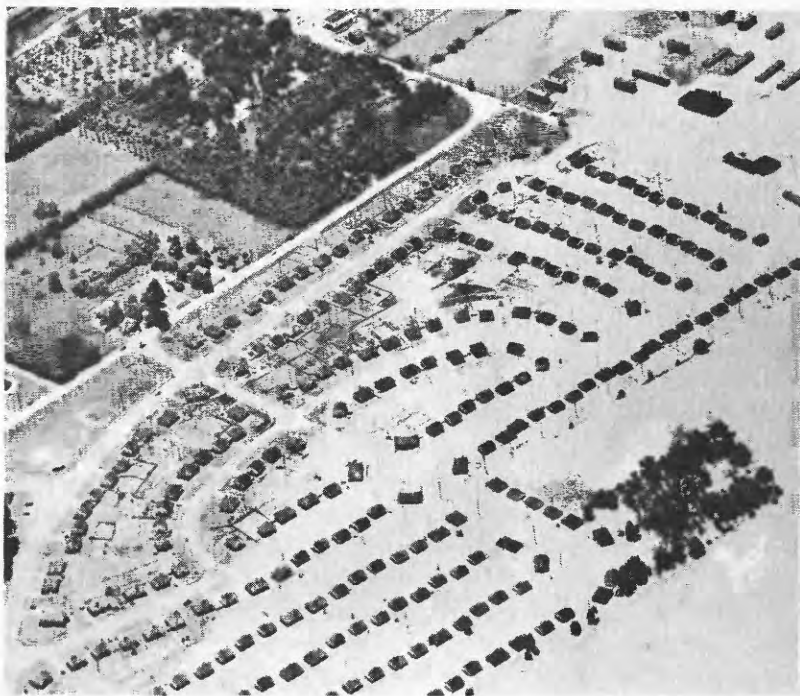
Two maps (figs. 4 and 5), with concurrent temperatures plotted, have been selected to show typical rather than mean flow patterns during the contrasting periods. They are for the 850-millibar surface, at approximately 5,000 feet, which can be taken as the mean elevation of the basin. On the map for May 1, about the middle of the cold period, flow into the basin is from the northwest, with temperatures near or below freezing throughout the basin. On the map for May 27, about the middle of the warm period, flow into the basin is from the south or southeast, and temperatures in the basin are of the order of  $70^{\circ}$ , indicating temperatures near  $90^{\circ}$  at sea level and in





A. UNITED STATES COAST GUARD RESCUING STRANDED FAMILY ON SAUVIES ISLAND IN COLUMBIA RIVER ABOUT 20 MILES NORTHWEST OF PORTLAND, OREG.

Courtesy of The Oregonian.



B. FRUIT VALLEY HOMES, HOUSING PROJECT NEAR VANCOUVER, WASH.

Courtesy of The Oregonian.



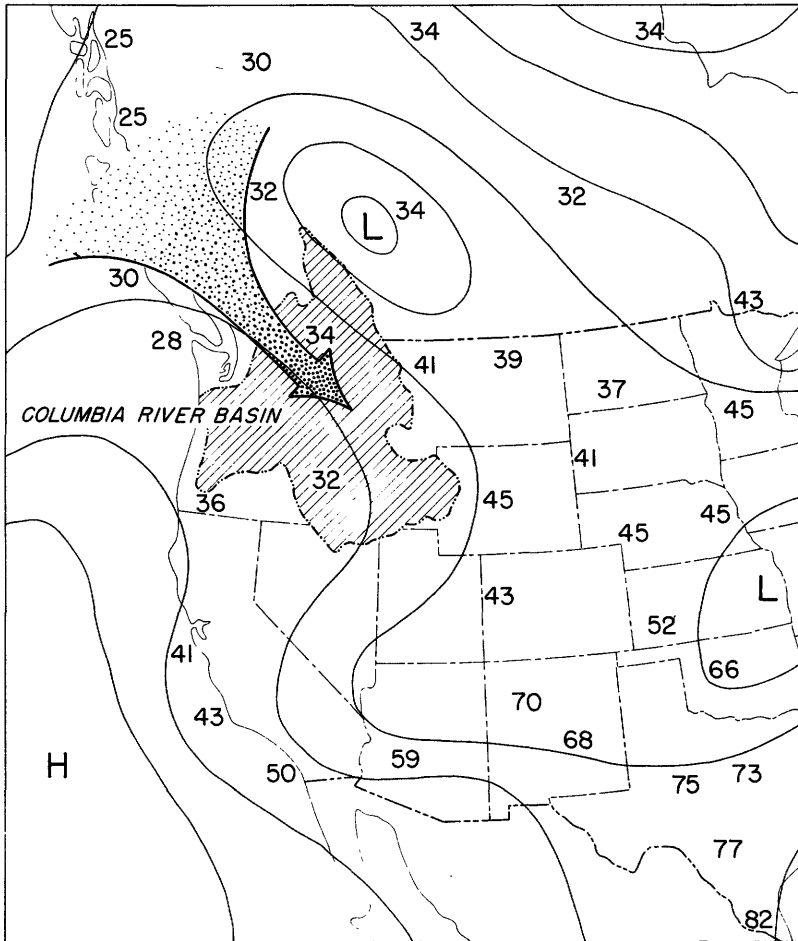


Figure 4.--Map showing air-flow pattern and air temperatures ( $^{\circ}\text{F.}$ ) at 850 millibars (about 5,000 feet altitude), 7 p.m. May 1, 1948.

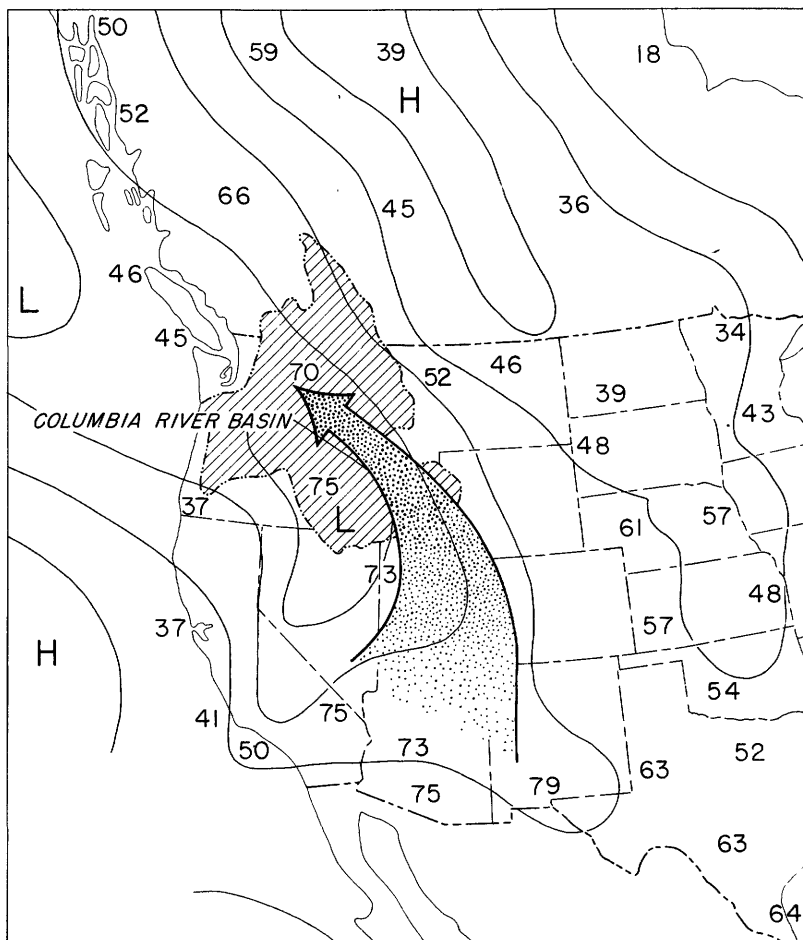


Figure 5.--Map showing air-flow pattern and air temperature ( $^{\circ}\text{F.}$ ) at 850 millibars (about 5,000 feet altitude), 7 p.m. May 27, 1948.

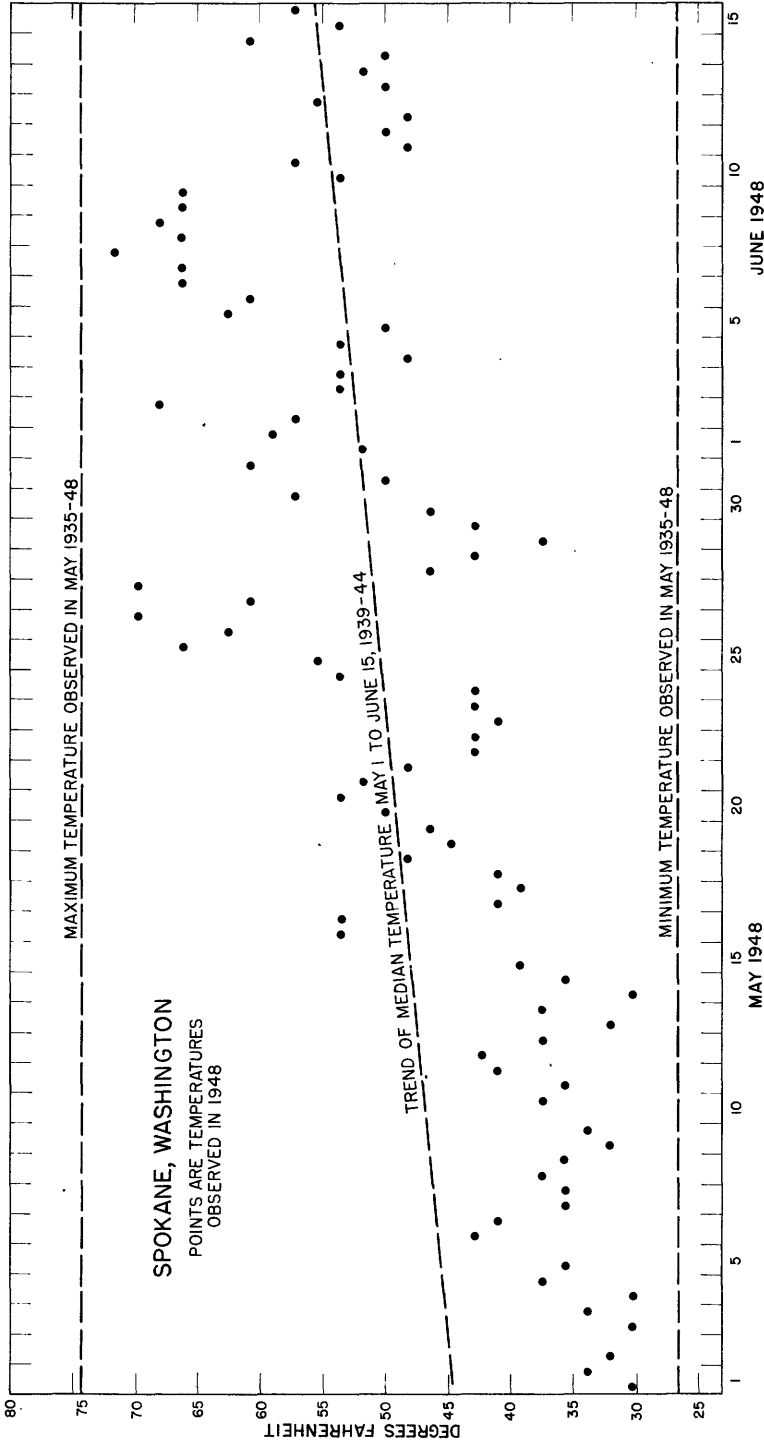


Figure 6.--Chart showing air temperatures at an altitude of 5,000 feet, at Spokane, Wash., May 1 to June 15, 1948.

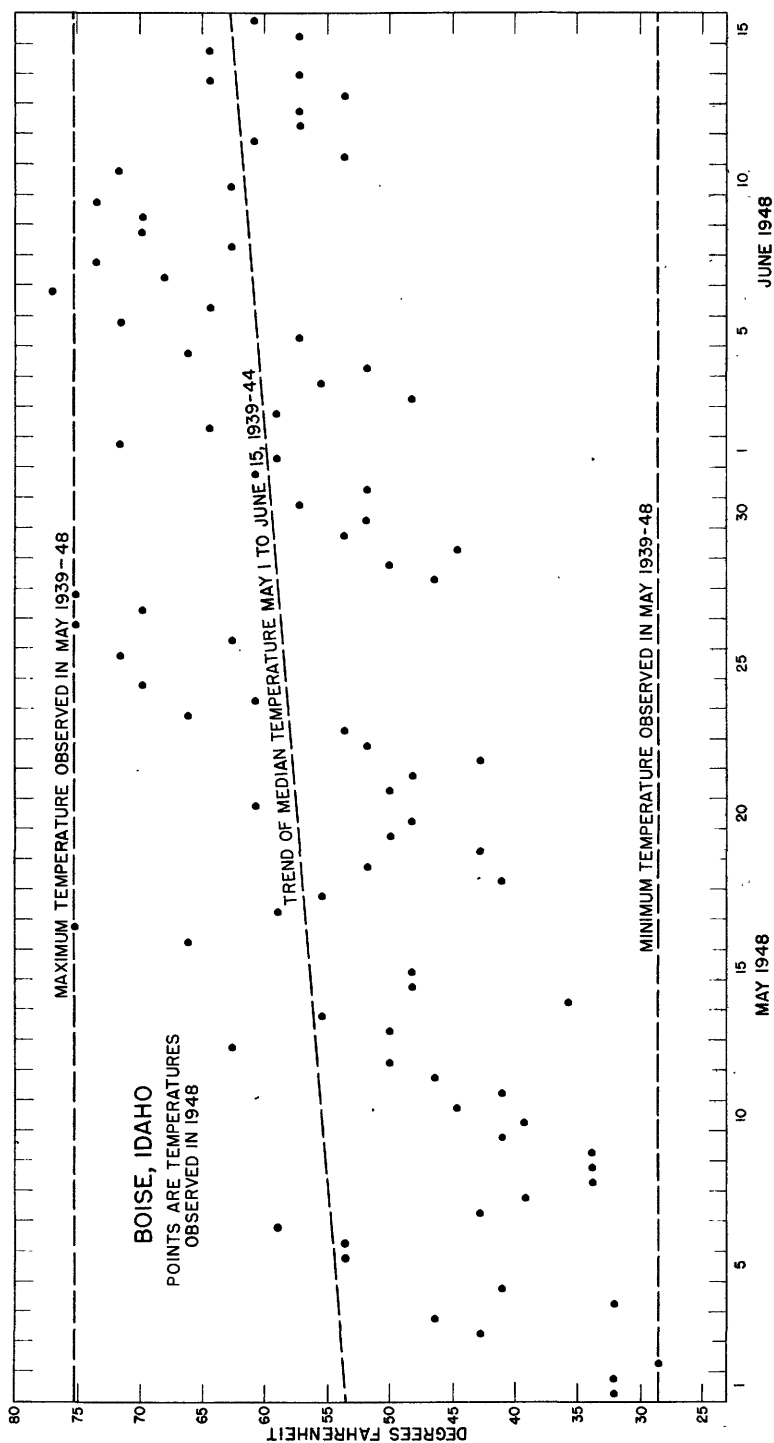


Figure 7.---Chart showing air temperatures at an altitude of 5,000 feet at Boise, Idaho, May 1 to June 15, 1948.

the 50's at 10,000 feet--far above freezing throughout the range of altitudes.

There were interesting day-to-day variations from the synoptic patterns presented. In the cold period some days were comparatively dry, others comparatively wet. In both cases, as in the mean pattern, a low was centered north of latitude 45° and east of longitude 140°. When the low was off the coast the flow over the basin was from the southwest, cold but with heavy precipitation. When the low was inland flow was from the northwest, still cold but with less precipitation. An important difference was the greater moisture content of the current from the southwest and its instability due to short water trajectory. During the warm period the low was characteristically centered farther south, near northern California. When off the coast its induced flow from the south brought air of great moisture content to the basin, with resultant heavy rainfall. As the low moved eastward into the continent the northward flow was more and more from a continental source, bringing somewhat warmer but now drier air, with less rainfall.

With the snow pack already of above-normal depth in early April, the two periods described provided an unusually efficient combination of factors to intensify the flood flow. During the cold period the snowfall was heavy, while the cold temperatures prevented the melting that normally begins in this period. Thus the early snow-melt contribution, ordinarily discharged from the southern tributaries and carried out to sea before the arrival of snow-melt discharge from the upper Columbia, was held up. When the warm period came, melting took place over the entire basin simultaneously, increasing the snow-melt discharge at the mouth. To the snow melt was added the runoff from concurrent rainfall.

Part of the unusual sequence of circumstances combining to make this flood of the first magnitude is illustrated in the graphs of the variation of temperature, from May 1 to June 15, at 5,000 feet at two radiosonde stations in the basin, Spokane and Boise (figs. 6 and 7). The solid line shows the normal trend of the median temperature, the temperature exceeded 50 percent of the time. Dashed lines show the extreme maximum and minimum observed temperatures for May at this level, for the period of upper-air record through 1948. The dots show the actual temperatures observed during 1948. Most of the 1948 observations fall below the median during the first half of May and above the median thereafter. Furthermore, the observed May 1948 temperatures include the extremes of record at Boise and closely approach the extremes at Spokane--with the lowest observed at the beginning of the month and with the highest observed at the end of the month at each station. The abruptness of such a change emphasizes the infrequency of the combination of events which produced the 1948 flood.

#### Precipitation

Water content of snow as indicated by snow surveys on or about April 1, 1948, although above normal, was not significantly different from that on April 1, 1946, when considering the Columbia River Basin as a whole. In some areas in the basin the water content even on April 1, 1947, was comparable to, or even greater than, that on April 1, 1948.

On April 1, 1946, the Soil Conservation Service forecast "Throughout Columbia Basin, especially in Oregon, Washington, and British Columbia, unusually high river stages can be expected. Potential flood hazard exists in some areas along the east

and west slopes of the Cascades and along the lower reaches of Kootenai River....." The Weather Bureau forecast "near-normal precipitation from April through June will result in above-normal water supply over virtually the entire Columbia Basin....., while precipitation near the record maximum will result in flows considerably above normal but, with the exception of the Spokane, nowhere approaching the record maximum..."

On April 1, 1948, the outlook for high runoff was quite similar. Conditions did not yet point to the imminence of a major flood. The Department of Lands and Forests, Water Rights Branch, British Columbia, forecast "The runoff indicated for the Kootenay, Columbia, and tributary drainage.....will be above normal, providing normal temperatures and precipitation prevail during the runoff period. On account of the lateness of the spring, the possible increase in snow since the end of March, and the lack of snow melt to date there is a potential flood hazard on the Kootenay River.....particularly if high temperatures or excessive precipitation occur from now on. If the snow is given a chance to melt slowly there should be no hazard." The Weather Bureau forecast that "Based on the assumption of near-normal precipitation for the remainder of the water year, the Columbia Basin above Grand Coulee and the Clearwater [in Snake River Basin] will have much above normal runoff, approaching in places the maximum of record....." The Soil Conservation Service forecast that "The above-normal snow pack [in the upper Columbia Basin] could cause relatively high river stages this year.... Relatively high water may again be expected in Kootenai River. Flood protection measures are warranted....."

By May 1, 1948, differences between flood-producing factors in 1946 and 1948 were apparent. Increases in water content of snow at higher altitudes during April were generally greater in 1948 than in 1946, and decreases at lower altitudes were less. Runoff in April 1946 was somewhat higher than normal and valley precipitation less than normal, which tended to ease the flood hazard, whereas opposite conditions prevailed in April 1948, so that by May 1, 1948, a flood of damaging proportions was almost a certainty. Flood forecasts by the Weather Bureau and Soil Conservation Service as of May 1, 1948, are presented in greater detail on page 5.

Precipitation during the 1948 flood period was doubtless a prominent factor in producing the flood. Figure 8 presents an **isohyetal** map of Columbia River Basin showing total precipitation during the period May 16-31, 1948. Figures 9 and 10 show daily precipitation at various points in the basin during the period January 1 to June 30, 1948. No snow surveys were made in the basin after May 1, and only the regular United States Weather Bureau precipitation records are available after this date; however, it is known that snow fell at higher altitudes even after May 1, owing to the subnormal temperatures that prevailed until May 15. During May precipitation was considerably above normal over the parts of the basin where the flood was most severe. In Washington precipitation measured at regular United States Weather Bureau stations averaged 5.26 inches in May 1948 as compared with 1.02 inches in May 1946; precipitation at two widely separated Weather Bureau stations in Yakima River Basin averaged 5.00 inches in May 1948 as compared with 2.01 inches in May 1946. In northern Idaho Weather Bureau precipitation records indicated an average of 5.51 inches in May 1948 as compared with 1.66 inches in May 1946 and in the Columbia River Basin in western Montana 3.33 inches in May 1948 as compared with 1.27 inches in May 1946.



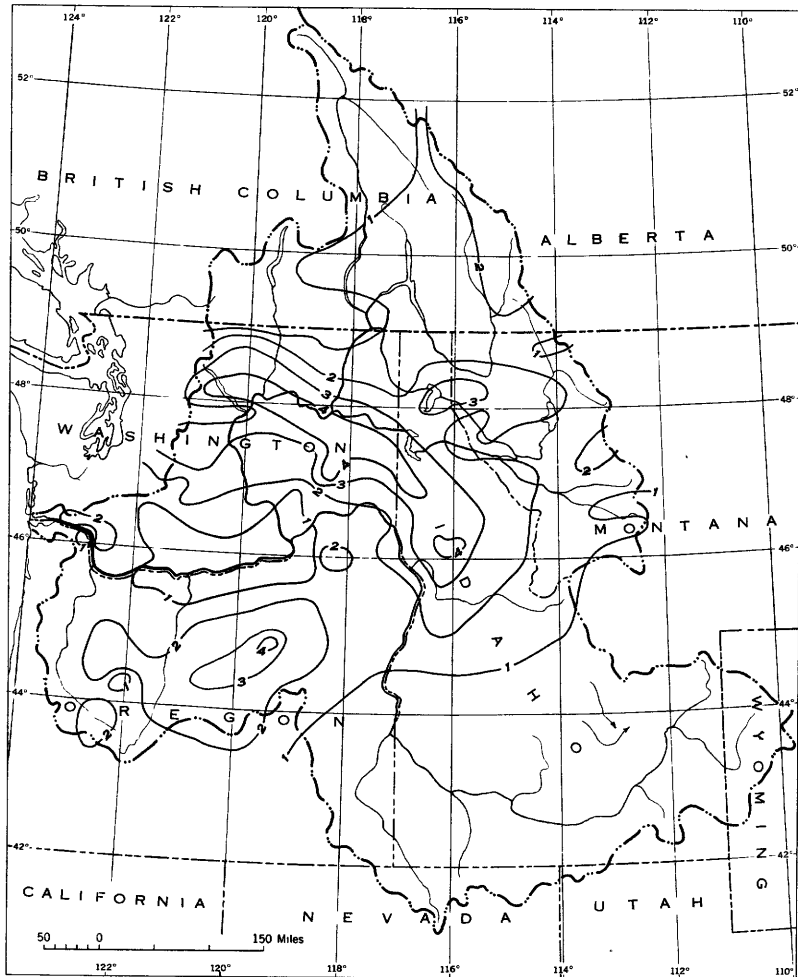


Figure 8.--Isohyetal map of Columbia River Basin showing total precipitation, in inches, May 16-31, 1948.

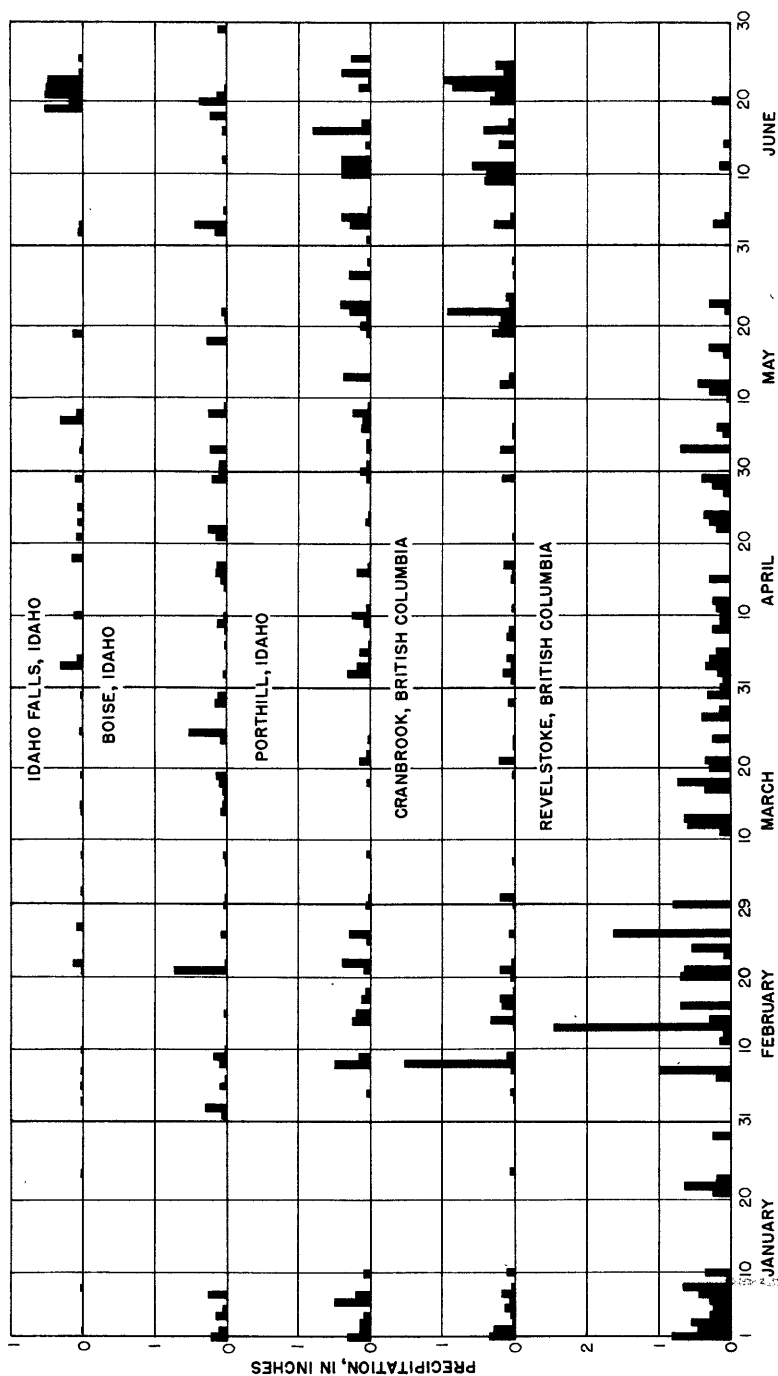


Figure 9.--Daily precipitation at various precipitation stations of the United States Weather Bureau in Idaho and of the Meteorological Service, Dominion of Canada, in British Columbia, January 1 to January 30, 1948.

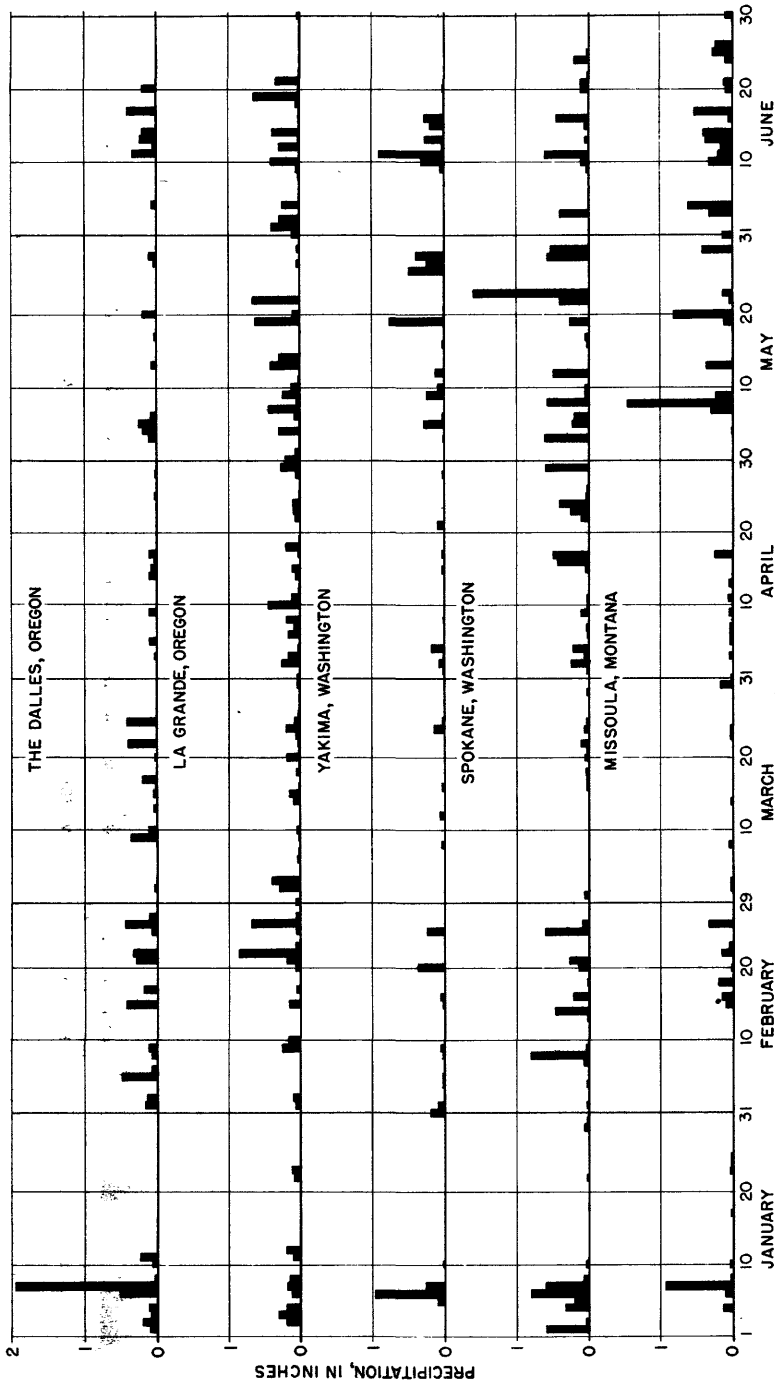


Figure 10.--Daily precipitation at various precipitation stations of the United States Weather Bureau in Oregon, Washington, and Montana, January 1 to June 30, 1948.

Although the water content of the snow on May 1 is an index of the volume of seasonal runoff that may be expected, it does not necessarily indicate the probable runoff pattern, which is determined to a great extent by temperatures during May and June. Temperatures associated with the flood are discussed elsewhere in this report.

Late seasonal snowfall seems to present a greater flood hazard than early seasonal snow, which settles into a dense pack. For a given depth of water in the snow on May 1, there appears to be some correlation between change in water content during April and volume of subsequent flood runoff.

The two snow courses in the Kootenai River Basin in Montana that were measured on May 1 in both years showed slightly greater water content on May 1, 1946, than on May 1, 1948; yet the average change during April 1946 was zero, while during April 1948 there was an average gain of about 2 inches. The runoff of Kootenai River at Leonia, Idaho, during May and June was 9.32 inches in 1946 and 12.06 inches in 1948. Peak discharges were 77,000 second-feet on May 30, 1946, and 123,000 second-feet on May 28, 1948.

In Yakima River Basin in Washington, five snow courses measured on May 1 showed slightly greater water content in 1946 than in 1948. Two of these courses, which were also measured on April 1, showed an average loss in water content of 10 inches during April 1946, while the loss during April 1948 was less than 2 inches. The runoff of Yakima River at Kiona, Wash., during May and June was 3.30 inches in 1946 and 5.24 inches in 1948. Peak discharges were 15,300 second-feet on May 29, 1946, and 37,900 second-feet on May 31, 1948.

In Pend Oreille River Basin in Idaho and Washington, five snow courses measured on May 1 showed appreciably more water content in 1946 than in 1948. One of these courses, which was also measured on April 1, showed a loss of 6.7 inches in water content during April 1946 and a loss of only 1.9 inches during April 1948. The runoff of Pend Oreille River below Z Canyon, near Metaline Falls, Wash., during May and June was 6.71 inches in 1946 and 10.17 inches in 1948. Peak discharges were 88,300 second-feet on June 8, 1946, and 171,300 second-feet on June 13, 1948.

Table 2, taken from "Federal-State Cooperative Surveys and Irrigation Water Forecasts," by the Soil Conservation Service, lists water content of snow at courses measured on or about April 1 for the years 1946, 1947, and 1948. Snow surveys were also made on or about May 1 at a smaller number of courses; hence data for April 1 are shown because greater coverage is afforded. The last column of the table shows change during April 1948 for courses also measured on May 1, so water content as of May 1, 1948, can be computed if desired. A few courses in the basin are measured only on May 1 and not on April 1; data for these courses do not appear in the table.

Figure 11 presents a map of the basin showing water content of snow on or about April 1, 1948, based on data in table 2.

As the flood of May-June 1948 in the Columbia River Basin was the greatest basin-wide flood since that of 1894, and because of the similarity in occurrence of the two floods, a comparison of the precipitation in the two flood years is of interest. Plate 5 presents maps of the basin showing total precipitation at a number of corresponding points during the period October 1 to May 31 in 1893-94 and in 1947-48. Figure 12 shows cumulative monthly and average precipitation for various United States Weather Bureau precipitation stations for October 1 to June 30, 1893-94 and 1947-48.



MAPS OF COLUMBIA RIVER BASIN, SHOWING TOTAL PRECIPITATION DURING THE PERIODS OCTOBER 1 TO MAY 31, 1893-94, AND 1947-48

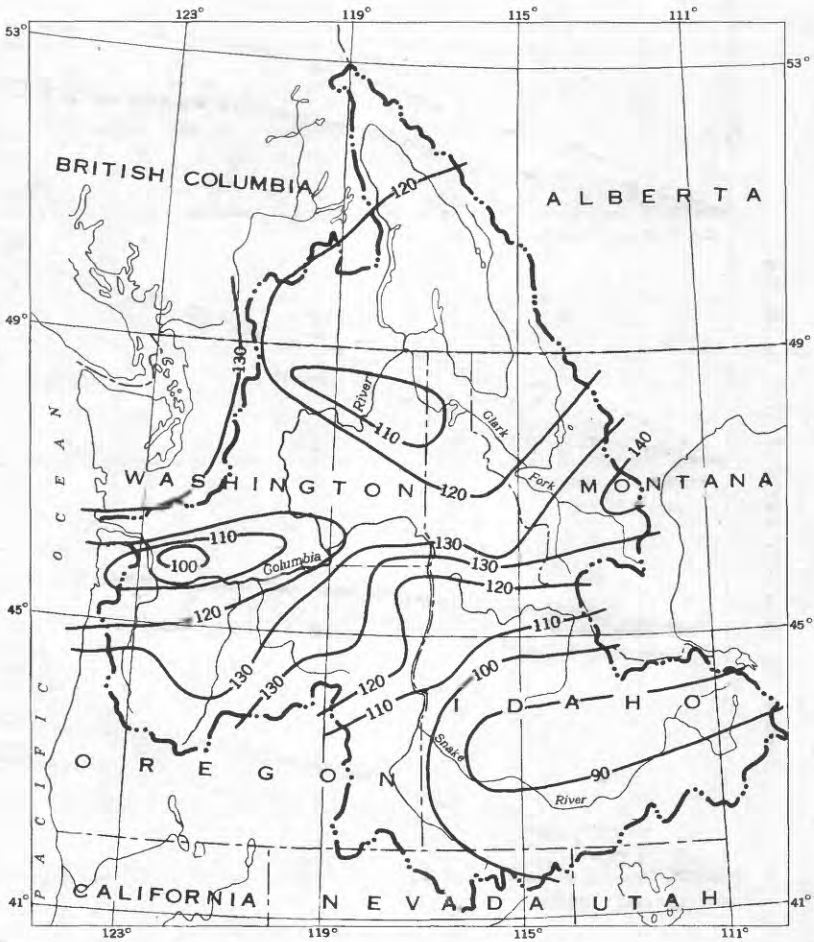


Figure 11.--Map of Columbia River Basin showing depth, in relation to average, of water content of snow on the ground about April 1, 1948.

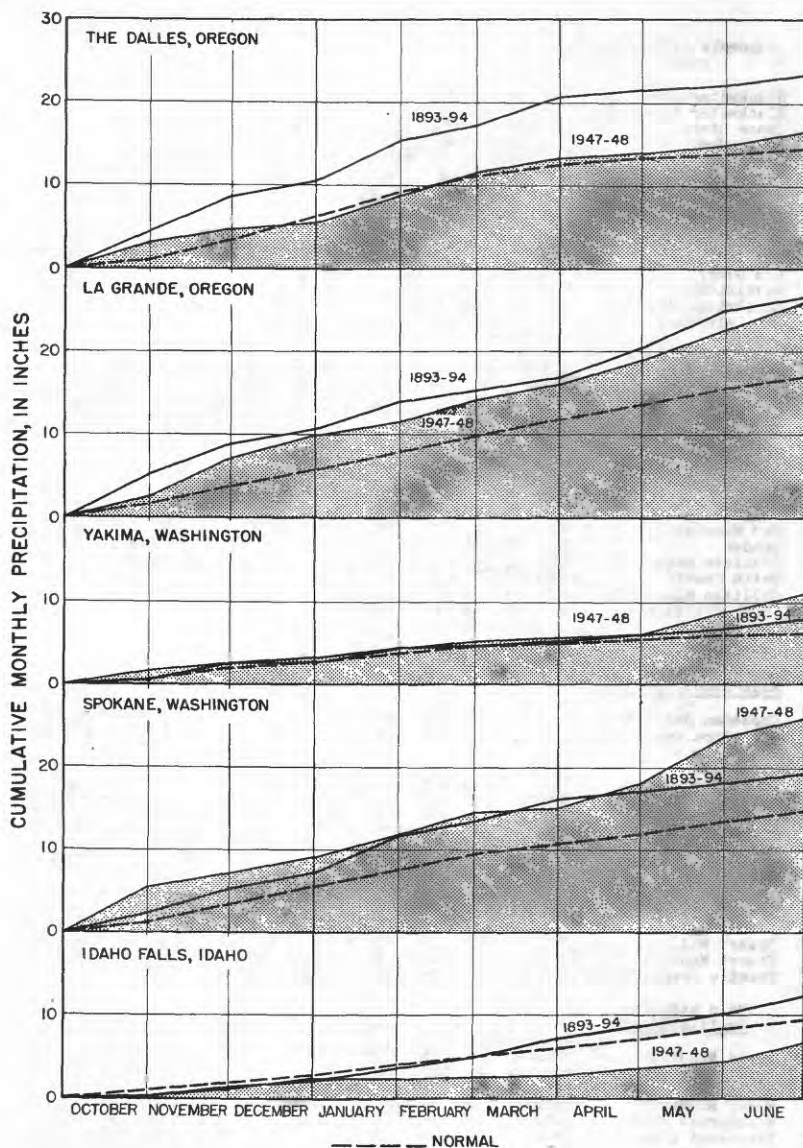


Figure 12.--Cumulative monthly precipitation for various precipitation stations of the United States Weather Bureau for October 1 to June 30, 1893-94 and 1947-48.

Table 2.--Equivalent depth of water, in inches, determined by snow surveys about April 1

Snow course	State or Province	Lat. and Long. or Sec. Twp. Rge.	Elevation (feet)	Average prior to 1948		1946	1947	1948	Change during April 1948
				No. of years	Depth.				
COLUMBIA RIVER MAIN STEM									
Blackwater Creek	B.C.	51°34'-117°23'	5,200	-	-	-	-	16.3	-
Blackwater Lookout	B.C.	51°34'-117°23'	5,500	-	-	-	-	16.8	-
Canoe River	B.C.	52°51'-119°08'	3,000	7	3.2	3.0	4.0	6.0	-
Beaverfoot	B.C.	51°16'-116°52'	6,200	-	-	-	-	6.6	-
Farron	B.C.	49°17'-118°07'	4,000	10	9.7	15.7	6.5	10.8	-7.1
Ferguson	B.C.	50°40'-117°30'	3,000	10	18.3	31.1	26.4	20.1	-1.6
Field	B.C.	51°20'-116°33'	3,800	9	3.6	6.4	6.0	5.4	-
Glacier	B.C.	51°14'-117°29'	4,100	11	21.5	32.9	30.5	24.8	+2.4
Invermere	B.C.	50°38'-116°18'	3,500	8	4.1	6.1	4.8	4.5	-
Middle River	B.C.	51°17'-118°00'	2,250	6	13.2	18.5	15.3	15.6	-
Mission Creek	B.C.	50°01'-118°59'	6,000	10	17.7	25.6	17.9	21.9	-
Old Glory	B.C.	49°09'-117°54'	7,000	-	-	-	-	19.0	-
Revelstoke	B.C.	50°54'-118°16'	1,800	10	8.1	14.3	13.4	12.8	-
Revelstoke Mountain	B.C.	51°04'-118°16'	6,000	1	-	-	47.6	45.2	+3.9
Sinclair Pass	B.C.	50°41'-115°59'	4,500	12	4.6	6.9	4.7	4.1	-3.3
KOOTENAI RIVER BASIN									
Baree Mountain	Mont.	1 25N 31W	6,000	9	34.7	46.8	51.5	40.6	+6.6
Bluebird Basin	Mont.	24 37N 26W	6,800	9	32.9	50.6	40.5	36.8	-
Ferguson	B.C.	50°40'-117°30'	3,000	10	18.3	31.1	26.4	20.1	-1.6
Fernie	B.C.	49°31'-115°01'	3,500	11	6.7	9.7	7.5	8.4	-4.5
Gray Creek	B.C.	49°37'-116°41'	5,100	-	-	-	-	19.6	+0.4
Kimberly	B.C.	49°42'-116°00'	3,750	10	4.1	6.5	4.9	5.5	-
Lardeau	B.C.	50°36'-117°16'	6,000	13	14.2	16.6	16.3	16.1	-
Marble Canyon	B.C.	51°12'-116°09'	5,000	1	-	-	11.3	13.2	-1.1
Nelson	B.C.	49°25'-117°14'	3,050	10	11.7	18.7	13.3	15.0	-
Red Mountain	Mont.	4 36N 29W	6,000	9	16.2	21.1	23.2	19.2	-3.0
Sandon	B.C.	49°59'-117°13'	3,500	10	10.0	14.4	12.3	11.4	-7.2
Sinclair Pass	B.C.	50°41'-115°59'	4,500	12	4.6	6.9	4.7	4.1	-3.3
Smith Creek	Idaho	29 64N 3W	4,800	9	38.1	57.7	51.4	42.2	-
Sullivan Mine	B.C.	49°45'-116°00'	5,100	2	13.5	13.4	13.6	14.7	-4.8
Upper Elk River	B.C.	50°01'-114°55'	-	-	-	-	-	9.1	-3.6
PEND OREILLE RIVER BASIN									
Main stem-Clark Fork									
Chessman Reservoir	Mont.	2 8N 5W	6,200	12	4.0	2.4	4.7	9.2	-4.6
East Fork ranger station	Mont.	16 2N 17W	5,400	9	3.6	3.0	5.5	6.5	-6.5
Intergaard	Mont.	6 5N 13W	6,450	3	6.3	6.2	7.0	10.2	-
Limestone Pass	Mont.	3,4 17N 15W	7,000	-	-	-	-	43.6	-
Medicine Creek	Idaho	24 43N 10E	6,200	8	33.0	37.7	46.4	40.3	-
North Fork Jocko	Mont.	3 17N 17W	6,330	7	36.6	48.5	52.0	46.2	-
Pipestone Pass	Mont.	11 1N 7W	7,200	9	5.3	5.7	7.0	7.4	-
Rainy Lake	Mont.	11 18N 16W	4,300	1	-	-	10.1	11.0	-
Skalkaho Summit	Mont.	30 6N 17W	7,258	9	20.7	23.7	29.9	29.2	-2.5
Slide Rock Mountain	Mont.	26 10N 16W	7,100	11	12.2	13.7	16.6	19.2	-
Southern Cross	Mont.	9 5N 13W	6,500	3	2.9	3.2	3.4	6.8	-
Stemple Pass	Mont.	16 15N 7W	6,900	9	8.6	8.6	13.0	10.3	-2.0
Storm Lake No. 2	Mont.	19 4N 13W	7,780	9	13.1	14.0	17.6	19.7	+1.5
Stuart Mill	Mont.	19 5N 13W	6,500	3	4.3	5.0	4.9	9.2	-
Stuart Mountain No. 1	Mont.	6 14N 18W	7,400	11	28.2	35.6	38.2	37.5	-6.3
Termlie Creek, Upper	Mont.	19 8N 5W	8,000	12	12.3	10.8	17.5	18.1	-3.5
Main stem-Pend Oreille River									
Baree Mountain	Mont.	1 25N 31W	6,000	9	34.7	46.8	51.5	40.6	+6.6
Benton Meadow	Idaho	27 58N 4W	2,344	11	1.2	1.0	0.0	1.5	-1.5
Benton Spring	Idaho	30 58N 3W	4,900	11	18.1	29.4	16.3	22.5	-1.9
Boyer Mountain	Wash.	7 31W 43E	5,250	2	26.4	35.6	17.1	25.1	-
Bunchgrass Meadow	Wash.	24 37N 44E	5,000	8	27.5	38.1	29.1	25.5	-3.1
Freezeout Summit	Mont.	21 15N 27W	7,000	11	28.4	34.2	39.8	33.7	-
Hoodoo Creek	Mont.	9,16 14N 27W	6,200	11	42.4	53.0	57.2	42.7	-
Lookout	Idaho	4 47N 6E	5,250	11	29.4	41.8	36.8	37.5	-2.7
Mosquito Ridge	Idaho	5 54N 2E	5,110	11	32.1	42.1	33.3	31.5	+3.1
Nelson	B.C.	49°25'-117°14'	3,050	10	11.7	18.7	13.3	15.0	-
Smith Creek	Idaho	29 64N 3W	4,800	9	38.1	57.7	51.4	42.2	-
Bitterroot River Basin									
East Fork ranger station	Mont.	16 2N 17W	5,400	9	3.6	3.0	5.5	6.5	-6.5
Gibbons Pass	Mont.	4 2S 19W	7,100	9	20.6	25.4	26.8	24.7	-3.4
Mud Creek Pasture	Mont.	24 11N 24W	4,500	11	5.1	4.1	0.0	8.7	-
Nezperce Camp	Mont.	19,20 1S 23W	5,580	11	11.8	11.9	12.9	14.9	-7.1
Nezperce Pass	Idaho	32 28N 16E	6,575	11	15.4	14.9	20.8	23.6	-8.5



Table 2.--Equivalent depth of water, in inches, determined by snow surveys about April 1--Continued

Snow course	State or Province	Lat. and Long. or Sec. Twp. Rge.		Elevation (feet)	Average prior to 1948		1946	1947	1948	Change during April 1948	
					No. of years	Depth					
PEND OREILLE RIVER BASIN--Continued											
<u>Bitterroot River Basin--Continued</u>											
Packers Meadow	Idaho	15	38N	15E	5,700	11	18.8	22.4	24.8	24.3	-2.3
Skalkaho Summit	Mont.	30	6N	17W	7,258	9	20.7	23.7	29.9	29.2	-2.5
Stuart Mountain No. 1	Mont.	6	14N	18W	7,400	11	28.2	35.6	38.2	37.5	-6.3
<u>Flathead River Basin</u>											
Big Creek	Mont.	6,7	22N	18W	6,750	6	34.4	46.0	-	45.8	-
Cattle Queen	Mont.	7	35N	17W	4,700	9	27.2	39.4	38.2	31.2	-
Desert Mountain	Mont.	24	31N	19W	5,600	9	13.2	15.3	21.2	14.7	+2
Goat Mountain	Mont.	47°31'	-112°55'	7,000	9	8.6	9.9	17.8	11.7	-	-
Hell Roaring Creek Divide	Mont.	35	32N	22W	5,770	6	28.0	36.4	34.1	28.6	+2.4
Kishenehn	Mont.	7	37N	21W	4,300	2	7.2	5.6	8.7	5.5	-
Limestone Pass	Mont.	3,4	17N	15W	7,000	-	-	-	-	43.6	-
Logan Creek	Mont.	34	30N	24W	4,300	9	6.9	8.6	10.3	10.0	-6.6
Marias Pass	Mont.	48°19'	-113°21'	5,250	12	15.5	17.7	23.3	18.9	-3.6	-
North Fork Jocko	Mont.	3	17N	17W	6,330	7	36.6	48.5	52.0	46.2	-
Rainy Lake	Mont.	11	18N	16W	4,300	1	-	-	10.1	11.0	-
Spotted Bear Mountain	Mont.	23	25N	15W	7,000	-	-	-	-	15.3	-
Strawberry Lake	Mont.	11	28N	19W	6,500	-	-	-	-	43.9	-
Trinkus Lake	Mont.	9	25N	17W	6,500	-	-	-	-	47.6	-
Trout Lake	Mont.	22	28N	17W	3,700	-	-	-	-	14.6	-
Upper Columbia snow laboratory, station 13	Mont.	10	29N	14W	5,240	2	14.4	10.4	18.3	13.7	-
SPOKANE RIVER BASIN											
Above Burke	Idaho	11	48N	5E	4,100	17	16.7	24.1	18.7	18.3	-
Above Roland	Idaho	35	47N	6E	4,350	18	23.6	34.7	27.2	25.9	-
Below Roland	Idaho	34	47N	6E	3,770	18	11.4	18.3	10.7	12.7	-
Copper Ridge	Idaho	5,6	50N	1W	4,800	12	27.7	38.8	20.0	30.9	+1.3
Forty-Nine Meadows	Idaho	6	43N	5E	5,000	11	30.7	44.6	34.6	35.6	-4
Fourth of July Summit	Idaho	6	49N	1W	3,100	22	9.1	12.7	5.0	9.8	-
Kellogg Peak	Idaho	19	48N	3E	5,560	17	24.8	37.0	30.8	28.4	-
Lookout	Idaho	4	47N	6E	5,250	11	29.4	41.8	36.8	37.5	-2.7
Medicine Creek	Idaho	24	43N	10E	6,200	8	33.0	37.7	46.4	40.3	+3.0
Mosquito Ridge	Idaho	5	54N	2E	5,110	11	32.1	42.1	33.3	31.5	-
Roland	Idaho	26	47N	6E	5,200	21	32.4	44.6	38.6	31.5	-
Sherwin	Idaho	28,33	42N	1E	3,200	22	11.2	17.6	10.7	11.8	-
Sunset	Idaho	28	49N	5E	5,600	25	29.2	38.6	36.6	28.9	-
SANPOIL RIVER BASIN											
Sherman Creek Pass	Wash.	19	36N	35E	5,350	9	12.4	19.2	8.6	9.2	-
OKANOGAN RIVER BASIN											
Aberdeen Lake	B.C.	50°08'	-119°03'	4,300	12	5.6	7.9	3.9	5.6	-	-
Bouleau Creek	B.C.	50°16'	-119°35'	5,000	1	-	-	7.9	9.7	-	-
Brookmere	B.C.	49°49'	-120°52'	3,200	3	8.9	12.1	10.6	7.6	-	-1.5
Freezeout Meadows	Wash.	8	40N	16E	6,000	4	24.7	32.3	35.6	39.9	-
Harts Pass	Wash.	7	37N	18E	6,500	7	36.5	51.8	43.4	45.1	+3.1
McCulloch	B.C.	50°01'	-118°59'	6,000	10	17.7	25.6	17.9	21.9	-	-
Mutton Creek No. 1	Wash.	30	37N	24E	5,700	8	10.3	14.8	7.0	9.2	+2.9
Mutton Creek No. 2	Wash.	19	37N	24E	6,000	2	13.0	16.3	9.6	11.8	+4.1
Rusty Creek	Wash.	18	35N	24E	4,000	4	5.1	9.4	2.4	3.3	-3.3
Salmon Meadows	Wash.	33	37N	24E	4,500	8	8.2	13.8	5.7	6.6	-1.5
Summerland Reservoir	B.C.	49°50'	-120°02'	4,300	12	8.1	12.9	6.6	7.5	-	-
Trout Creek	B.C.	49°46'	-120°12'	4,700	12	6.3	9.2	6.2	7.2	-	+5
METHOW RIVER BASIN											
Dagger Lake	Wash.	48°28'	-120°39'	5,200	16	36.0	48.7	48.3	42.1	-	-
Harts Pass	Wash.	7	37N	18E	6,500	7	36.5	51.8	43.4	45.1	+3.1
Mutton Creek No. 2	Wash.	19	37N	24E	6,000	2	13.0	16.3	9.6	11.8	+4.1
Rusty Creek	Wash.	18	35N	24E	4,000	4	5.1	9.4	2.4	3.3	-3.3
Salmon Meadows	Wash.	33	37N	24E	4,500	8	8.2	13.8	5.7	6.6	-
CHELAN LAKE BASIN											
Agnes Creek	Wash.	48°12'	-120°56'	5,400	16	43.6	60.4	51.9	63.2	-	-
Bridge Creek	Wash.	48°26'	-120°52'	2,100	17	18.3	30.5	22.9	24.5	-	-
Bridge Creek Trail	Wash.	48°27'	-120°52'	2,680	17	23.2	37.1	27.3	25.8	-	-
Bullion	Wash.	48°23'	-120°49'	1,460	17	5.1	8.3	6.1	8.7	-	-
Cloudy Pass	Wash.	48°12'	-120°55'	6,500	17	39.7	60.5	45.0	51.9	-	-
Cottonwood	Wash.	48°27'	-120°58'	2,500	17	29.7	47.1	37.5	34.7	-	-
Dagger Lake	Wash.	48°28'	-120°39'	5,200	16	36.0	48.7	48.3	42.1	-	-

Table 2.--Equivalent depth of water, in inches, determined by snow surveys about April 1--Continued

Snow course	State or Province	Lat. and Long. or Sec. Twp. Rge.	Elevation (feet)	Average prior to 1948		1946	1947	1948	Change during April 1948
				No. of years	Depth				
CHELAN LAKE BASIN--Continued									
Greenwood Flat	Wash.	48°13'-120°50'	3,540	17	19.9	37.2	21.2	20.2	-
Little Meadows	Wash.	48°12'-120°54'	5,275	17	37.8	51.8	42.6	46.6	-
Lyman Lake	Wash.	48°12'-120°55'	5,900	16	50.5	74.1	59.2	65.7	-
Park Creek Flat	Wash.	48°26'-120°55'	2,220	17	26.1	40.5	36.0	31.5	-
Park Creek Pass	Wash.	23 35N 14E	5,050	3	71.7	86.0	74.0	87.7	-
Park Creek Ridge	Wash.	48°27'-120°55'	4,600	16	35.3	53.4	42.1	42.2	-
Pass Creek	Wash.	48°20'-120°55'	2,500	16	23.8	38.5	27.9	31.5	-
Petersons	Wash.	48°28'-120°43'	3,730	16	23.0	33.2	30.6	27.7	-
Rainy Pass	Wash.	48°34'-120°44'	4,780	16	32.5	46.7	45.0	38.4	-
Seven Mile	Wash.	48°12'-120°44'	3,015	17	17.7	28.4	24.5	19.2	-
Two Mile	Wash.	48°11'-120°37'	2,020	17	6.8	11.6	8.7	9.9	-
Upper Meadows	Wash.	48°13'-120°56'	4,400	14	31.0	45.4	32.3	39.4	-
WENATCHEE RIVER BASIN									
Blewett Pass No. 2	Wash.	35 22N 17E	4,270	2	17.0	22.5	11.5	16.9	-3.2
Fish Lake	Wash.	34 24N 14E	3,371	5	32.1	41.0	30.0	31.0	-
Lyman Lake	Wash.	48°12'-120°55'	5,900	16	50.5	74.1	59.2	65.7	-
Stevens Pass	Wash.	14 26N 13E	4,070	4	50.7	61.9	50.0	55.2	-
YAKIMA RIVER BASIN									
Big Boulder Creek	Wash.	35 23N 14E	3,200	7	15.3	31.3	10.0	23.0	-
Blewett Pass No. 2	Wash.	35 22N 17E	4,270	2	17.0	22.5	11.5	16.9	-3.2
Bumping Lake	Wash.	46°52'-121°18'	3,450	29	12.1	26.2	7.4	-	-
Cayuse Pass	Wash.	15 16N 10E	5,300	7	77.2	139.5	86.8	94.0	-
City Cabin	Wash.	10 21N 10E	2,390	-	-	-	-	28.0	-
Corral Pass	Wash.	30 18N 11E	6,000	8	34.6	53.8	45.0	52.0	-
Fish Lake	Wash.	34 24N 14E	3,371	5	32.1	41.0	30.0	31.0	-
Fog Basin	Wash.	32 17N 11E	5,600	9	41.4	70.1	41.8	53.7	-
Lake Cle Elum	Wash.	15 20N 14E	2,200	9	2.8	10.4	0.0	-	-
North Fork Cedar	Wash.	8 21N 11E	3,900	1	-	-	33.8	41.2	-
Olallie Meadows	Wash.	19 22N 11E	3,625	3	47.7	68.9	39.2	59.4	-
Stampede Pass	Wash.	25 21N 11E	3,000	3	44.3	63.9	34.4	51.4	+5
Tunnel Avenue	Wash.	10 21N 12E	2,450	7	17.4	33.0	14.2	-	-
SNAKE RIVER BASIN									
Above Jackson Lake									
Arizona	Wyo.	3 46N 115W	6,850	29	16.3	19.3	15.8	15.5	-
Aster Creek	Wyo.	44°17'-110°37'	7,700	29	26.5	33.0	35.3	22.7	-
Base Camp	Wyo.	20 46N 113W	6,900	1	-	-	19.0	14.8	-
Coulter Creek	Wyo.	44°09'-110°33'	7,600	29	20.3	21.7	23.7	15.2	-
Glade Creek	Wyo.	44°08'-110°44'	7,200	29	21.3	22.0	21.5	19.8	-
Huckleberry Divide	Wyo.	32 48N 115W	7,300	29	17.8	19.9	17.1	15.1	-
Lewis Lake Divide	Wyo.	44°13'-110°40'	7,900	29	37.6	44.1	47.9	31.8	-
Moran	Wyo.	8,17 45N 114W	6,800	29	10.9	11.6	11.1	8.8	-
Snake River Station	Wyo.	44°08'-110°40'	6,780	29	18.2	19.9	17.8	17.7	-
Sylvan Pass	Wyo.	44°29'-110°02'	7,100	9	13.2	12.7	15.0	14.8	-
Thumb Divide	Wyo.	44°22'-110°35'	7,900	1	-	-	24.3	16.9	-
Moran Bay	Wyo.	14 45N 116W	6,800	29	18.9	20.9	21.9	18.3	-
Jackson Lake to Heise									
Afton ranger station	Wyo.	30 32N 118W	6,200	12	1.9	0	0	T	-
Blackrock	Wyo.	4 44N 111W	8,600	12	21.0	22.9	28.2	20.3	-
Blind Bull Summit	Wyo.	4 34N 115W	8,750	-	-	-	-	27.6	-
Bryan Flat	Wyo.	9 38N 115W	6,250	12	9.6	9.4	9.0	7.8	-7.8
CCC Camp	Wyo.	9 29N 118W	7,500	12	11.2	9.0	10.6	9.5	-
Cottonwood Lake	Wyo.	25 31N 118W	7,500	12	16.9	18.2	17.6	16.7	-
Deadman Ranch	Wyo.	28 35N 116W	6,534	11	9.7	9.2	6.3	9.5	-
East Rim Divide	Wyo.	32 37N 111W	7,950	12	11.3	11.6	9.7	7.7	-1.2
Four Mile Meadows	Wyo.	35 45N 112W	7,770	12	12.5	13.4	12.8	12.3	-
Greys Boundary	Wyo.	33 37N 118W	5,800	12	10.2	11.5	6.6	11.6	-
Gros Ventre Summit	Wyo.	36 40N 111W	8,750	-	-	-	-	10.0	-
Grover Park Divide	Wyo.	27 33N 118W	7,500	12	10.8	9.1	8.3	9.5	-
Poison Meadow	Wyo.	29 30N 116W	8,500	-	-	-	-	25.0	-
Salt River Summit	Wyo.	32 29N 118W	7,900	-	-	-	-	12.5	-
Teton Pass No. 2	Wyo.	24 41N 118W	8,500	3	35.8	34.5	42.0	30.5	-
Togwotee Pass	Wyo.	29 44N 110W	9,600	12	26.8	28.8	33.3	27.4	-
Turpin Meadows	Wyo.	14 45N 112W	6,930	12	10.0	9.4	8.8	10.0	-
Yellowjacket	Wyo.	33 42N 112W	7,675	11	6.5	5.7	5.9	4.9	-4.9
Heise to American Falls									
Austin Brothers Ranch	Idaho	27 7S 43E	6,450	12	8.6	8.0	7.4	-	-
Bechler ranger station	Wyo.	44°09'-111°03'	6,400	11	22.7	25.0	17.9	26.8	-

Table 2.--Equivalent depth of water, in inches, determined by snow surveys about April 1--Continued

Snow course	State or Province	Lat. and Long. or Sec. Twp. Rge.			Elevation (feet)	Average prior to 1948		1946	1947	1948	Change during April 1948
						No. of years	Depth				
SNAKE RIVER BASIN--Continued											
<u>Heise to American Falls--Continued</u>											
Big Springs	Idaho	34	14N	44E	6,500	12	19.5	23.2	20.7	18.1	-
Blackfoot Dam	Idaho	1	5S	40E	6,150	12	8.4	8.5	4.8	-	-
Blue Ledge Mine	Idaho	27	13N	38E	6,700	10	15.1	17.2	17.1	10.9	-
Camp Creek	Idaho	21	13N	36E	6,800	12	8.5	10.2	6.1	8.1	-
China Hat	Idaho	17	7S	42E	6,300	10	6.7	9.4	0.0	8.2	-
Grassy Lake	Wyo.	6	48N	117W	7,865	8	29.9	32.8	29.2	35.6	-
Island Park No. 2	Idaho	28	13N	43E	6,315	12	14.3	17.1	15.1	13.8	-
Kilgore	Idaho	6	12N	39E	6,200	11	10.6	11.6	6.1	8.4	-
Mink Creek	Idaho	33	7S	34E	6,300	3	12.8	17.0	6.6	16.2	-
Pebble Creek	Idaho	34	7S	37E	6,550	3	13.5	17.9	7.1	11.5	-
Slug Creek Divide	Idaho	15	10S	44E	7,225	12	15.2	17.2	12.2	13.3	-
Somsen Ranch	Idaho	25	5S	43E	7,000	12	11.3	14.1	9.5	-	-
State line	Idaho	32	3N	46E	6,400	12	15.1	14.0	11.0	13.1	-
Teton Pass No. 2	Wyo.	24	41N	118W	8,500	3	35.8	34.5	42.0	30.5	-
Valley View	Idaho	7	15N	44E	6,500	12	14.0	15.5	14.3	12.8	-
West Yellowstone	Mont.	34,35	13S	5E	6,700	11	10.6	12.6	10.4	-	-
<u>Tributaries below American Falls</u>											
Badger Creek	Idaho	21	15S	20E	6,900	1	-	-	9.1	12.2	-
Bear Creek Meadows	Nev.	31	46N	58E	7,800	5	19.0	22.0	15.0	20.0	-
Bostetter ranger station	Idaho	6	14S	19E	7,500	12	17.8	22.9	14.4	17.2	-
Fox Creek	Nev.	3	45N	58E	6,900	11	8.0	8.6	2.8	7.6	-
Magic Mountain	Idaho	14	14S	18E	6,700	5	18.8	25.0	12.4	17.4	-
Seventy-Six Creek	Nev.	6	44N	61E	7,000	1	-	-	6.7	11.2	-
Sublett	Idaho	8	12S	30E	6,000	11	12.2	13.3	-	10.3	-
<u>Big Lost River Basin</u>											
Copper Basin	Idaho	24	6N	21E	8,000	12	9.1	10.3	11.6	8.5	-
Stickney Mill	Idaho	9	6N	19E	7,500	12	8.6	12.4	13.4	8.0	-
White Knob	Idaho	25	7N	23E	7,700	12	9.8	10.2	10.4	7.4	-
<u>Big Wood River Basin</u>											
Couch Summit	Idaho	9	2N	14E	7,000	-	-	-	-	14.3	-
Galena	Idaho	3	6N	15E	7,500	10	17.2	21.7	19.0	13.9	-
Graham Ranch	Idaho	10	5N	17E	6,200	12	12.7	15.9	10.4	9.9	-
Mascot Mine	Idaho	8	4N	20E	7,900	12	14.8	17.1	17.9	13.2	-
Soldier ranger station	Idaho	19	2N	14E	6,100	9	11.1	14.8	7.1	8.9	-
Atlanta Summit	Idaho	23	5N	10E	7,500	12	30.2	36.8	30.9	26.7	-
Bogus Basin	Idaho	16	5N	3E	6,400	6	25.8	34.9	23.1	20.4	+2.7
Cape Horn	Idaho	2	12N	11E	6,500	11	17.0	23.3	18.0	19.6	-
Couch Summit	Idaho	9	2N	14E	7,000	-	-	-	-	14.3	-
Galena	Idaho	3	6N	15E	7,500	10	17.2	21.7	19.0	13.9	-
Moore Creek Summit	Idaho	19	7N	7E	6,100	12	28.9	38.4	32.1	23.0	+1.7
Redfish Lake	Idaho	3	9N	13E	6,600	11	8.7	12.9	10.7	8.6	-
Soldier ranger station	Idaho	19	2N	14E	6,100	9	11.1	14.8	7.1	8.9	-
Trinity Mountain	Idaho	7	3N	9E	7,400	14	39.4	56.2	41.3	37.5	-
<u>Owyhee River Basin</u>											
Big Bend	Nev.	30	45N	56E	6,800	12	9.9	10.9	3.6	8.3	-
Buckskin, Lower	Nev.	25	45N	39E	6,700	7	7.1	6.6	0.0	10.2	-
Buckskin, Upper	Nev.	14	45N	39E	7,200	12	11.2	9.1	1.4	10.4	-
Fish Creek	Oreg.	4	33S	33E	7,900	7	23.7	-	-	25.1	-
Fry Canyon	Nev.	32	43N	54E	6,800	6	8.9	9.7	4.4	7.9	-
Gold Creek ranger station	Nev.	32	45N	56E	6,600	7	6.1	5.5	0.0	5.8	-
Granite Peak	Nev.	27	44N	39E	7,800	8	12.0	16.6	7.2	9.7	-
Jack Creek, Lower	Nev.	19	42N	53E	7,000	7	2.8	3.1	0.0	4.7	-
Jack Creek, Upper	Nev.	9	42N	53E	7,250	7	9.9	12.6	4.2	11.6	-
Martin Creek	Nev.	24	44N	39E	6,700	7	8.1	7.8	1.1	9.7	-
Rodeo Flat	Nev.	31	43N	54E	7,000	6	9.7	11.1	4.2	9.1	-
South Mountain No. 2	Idaho	35	7S	5W	6,340	8	10.6	14.4	3.6	-	-
Taylor Canyon	Nev.	32	39N	53E	6,200	7	3.6	4.3	0.0	.5	-
<u>Payette River Basin</u>											
Big Creek Summit	Idaho	24	15N	5E	6,608	12	30.0	40.6	41.2	31.0	-
Bogus Basin	Idaho	16	5N	3E	6,400	6	25.8	34.9	23.1	20.4	+2.7
Crawford ranger station	Idaho	21	14N	4E	4,800	11	5.5	8.3	T	4.8	-

Table 2.--Equivalent depth of water, in inches, determined by snow surveys about April 1--Continued

Snow course	State or Province	Lat. and Long. or Sec. Twp. Rge.	Elevation (feet)	Average prior to 1948		1946	1947	1948	Change during April 1948
				No. of years	Depth				
SNAKE RIVER BASIN--Continued									
Payette River Basin--Continued									
Deadwood River Dam	Idaho	8 11N 7E	5,500	12	14.2	16.2	16.3	13.6	-3.3
Deadwood Summit	Idaho	23 14N 7E	7,000	12	39.9	48.5	48.9	37.3	-
Lake Fork	Idaho	3 18N 4E	6,000	12	14.5	17.1	10.7	13.7	-
Moore Creek Summit	Idaho	19 7N 7E	6,100	12	28.9	38.4	32.1	23.0	+1.7
Rock Flat Summit	Idaho	1 18N 2E	5,200	2	18.2	20.6	15.8	15.9	-
Secesh Summit No. 2	Idaho	34 22N 4E	6,600	6	32.8	38.5	40.2	37.5	-
Squaw Meadow	Idaho	8 21N 4E	5,800	10	32.5	39.0	38.8	35.5	-
Trail Creek	Idaho	19 11N 7E	5,900	9	16.1	-	14.1	12.8	-2.6
Cape Horn	Idaho	2 12N 11E	6,500	11	17.0	23.3	18.0	19.6	-
Malheur River Basin									
Barney Creek	Oreg.	16 14S 36E	5,950	3	7.9	11.2	5.2	8.8	-
Blue Mt. Springs	Oreg.	21 15S 35E	5,900	12	14.7	22.0	10.4	14.9	-
Crane Prairie	Oreg.	24 16S 34E	5,375	9	7.6	10.8	2.4	10.4	-
Lake Creek	Oreg.	10 16S 33½E	5,120	9	9.6	14.3	4.8	10.0	-
Rock Spring	Oreg.	23 18S 32E	5,100	12	4.1	5.1	0.0	5.0	-
Stinking Water	Oreg.	33 21S 34E	4,800	8	.8	-	0.0	0.0	-
Weiser River Basin									
Boulder Creek	Idaho	15 20N 1W	5,500	10	20.9	28.3	19.3	23.4	-
Placer Creek	Idaho	15,16 17N 3W	6,000	10	16.2	25.3	13.5	18.8	-
Burnt River Basin									
Barney Creek	Oreg.	16 14S 36E	5,950	3	7.9	11.2	5.2	8.8	-
Blue Mt. Summit	Oreg.	6 12S 36E	5,098	12	6.6	11.3	2.4	9.2	-
Dooley Mountain	Oreg.	32 11S 40E	5,430	9	7.8	10.8	1.9	9.5	-
Tipton	Oreg.	34 10S 35½E	5,100	10	9.0	16.1	1.0	9.0	-
Powder River Basin									
Anthony Lake	Oreg.	18 7S 37E	7,125	12	26.2	36.0	30.6	31.4	-
Bourne	Oreg.	33 8S 37E	5,800	12	14.7	20.6	9.6	15.4	-
Dooley Mountain	Oreg.	32 11S 40E	5,430	9	7.8	10.8	1.9	9.5	-
Ellierson Meadows	Oreg.	18 8S 38E	5,400	10	10.8	15.2	6.8	9.2	-
Gold Center	Oreg.	21 9S 36E	5,340	9	10.2	14.6	6.9	13.5	-
Goodrich Lake	Oreg.	34,35 8S 38E	6,700	1	-	-	31.3	34.7	-
Summit Springs	Oreg.	9 6S 37E	6,000	12	20.9	20.5	21.8	24.2	-
Taylor Green	Oreg.	3 6S 42E	5,740	10	15.0	21.4	12.4	18.9	-
Salmon River Basin									
Big Creek Summit	Idaho	24 15N 5E	6,608	12	30.0	40.6	41.2	31.0	-
Big Hole Pass	Mont.	28 3S 18W	7,340	-	-	-	-	14.9	-
Boulder Creek	Idaho	15 20N 1W	5,500	10	20.9	28.3	19.3	23.4	-
Cape Horn	Idaho	2 12N 11E	6,500	11	17.0	23.3	18.0	19.6	-
Deadwood Summit	Idaho	23 14N 7E	7,000	12	39.9	48.5	48.9	37.3	-
Gibbons Pass	Mont.	4 2S 19W	7,100	9	20.6	25.4	26.8	24.7	-3.4
Lemhi	Mont.	9 10S 15W	7,480	-	-	-	-	11.1	-
Mill Creek Summit	Idaho	8 13N 17E	8,870	11	18.8	20.7	22.4	18.2	-
Moose Creek	Idaho	22,27 27N 21E	6,200	11	14.3	16.8	20.4	18.6	-5.1
Redfish Lake	Idaho	3 9N 13E	6,600	11	8.7	12.9	10.7	8.6	-
Rock Flat Summit	Idaho	1 18N 2E	5,200	2	18.2	20.6	15.8	15.9	-
Secesh Summit No. 2	Idaho	34 22N 4E	6,600	6	32.8	38.5	40.2	37.5	-
William Creek Summit	Idaho	34 21N 20E	8,710	11	11.5	12.8	13.9	15.7	-
Imnaha River Basin									
Aneroid Lake No. 1	Oreg.	16 4S 45E	7,480	11	34.1	44.1	38.2	38.4	-
Aneroid Lake No. 2	Oreg.	16 4S 45E	7,000	6	27.7	33.0	29.4	32.8	-
Coverdale	Oreg.	22 5S 47E	4,250	3	8.8	18.5	0.0	12.1	-
Grande Ronde River Basin									
Aneroid Lake No. 1	Oreg.	16 4S 45E	7,480	11	34.1	44.1	38.2	38.4	-
Aneroid Lake No. 2	Oreg.	16 4S 45E	7,000	6	27.7	33.0	29.4	32.8	-
Anthony Lake	Oreg.	18 7S 37E	7,125	12	26.2	36.0	30.6	31.4	-
Beaver Reservoir	Oreg.	8 5S 37E	5,340	8	10.0	11.4	8.2	14.8	-
Camp Carson	Oreg.	33 6S 36E	5,970	9	8.5	10.3	5.8	13.6	-
Moss Spring	Oreg.	28 3S 41E	5,850	9	23.0	27.1	18.5	29.7	-
Schneider Meadows	Oreg.	35 6S 45E	5,400	10	27.5	36.3	20.4	27.1	-
Summit Springs	Oreg.	9 6S 37E	6,000	12	20.9	20.5	21.8	24.2	-
Taylor Green	Oreg.	3 6S 42E	5,740	10	15.0	21.4	12.4	18.9	-
Toll Gate	Oreg.	32 4N 38E	5,070	12	25.9	39.9	21.4	34.0	-

Table 2.--Equivalent depth of water, in inches, determined by snow surveys about April 1--Continued

Snow course	State or Province	Lat. and Long. or Sec. Twp. Rge.			Elevation (feet)	Average prior to 1948		1946	1947	1948	Change during April 1948
						No. of years	Depth				
SNAKE RIVER BASIN--Continued											
<u>Clearwater River Basin</u>											
Forty-Nine Meadows	Idaho	6	43N	5E	5,000	11	30.7	44.6	34.6	35.6	-0.4
Hoodoo Creek	Mont.	9,16	14N	27W	6,200	11	42.4	53.0	57.2	42.7	-
Kit Carson Pasture	Idaho	4	27N	16E	4,700	11	6.9	-	6.0	10.3	-
Nezperce Pass	Idaho	32	28N	16E	6,575	11	15.4	14.9	20.8	23.6	-
Packers Meadow	Idaho	15	38N	15E	5,700	11	18.8	22.4	24.8	24.3	-2.3
Savage Pass	Idaho	18	36N	15E	6,600	11	22.2	26.7	33.6	32.5	-1.4
Shanghai Summit	Idaho	7	37N	6E	4,600	10	20.2	30.4	24.8	33.5	-1.6
Sherwin	Idaho	28,33	42N	1E	3,200	20	10.9	6.2	8.7	11.8	-
WALLA WALLA RIVER BASIN											
Toll Gate	Oreg.	32	4N	38E	5,070	12	25.9	39.9	21.4	34.0	-
UMATILLA RIVER BASIN											
Arbuckle Mountain	Oreg.	33	4S	29E	5,400	12	10.3	15.6	3.7	12.5	-
Emigrant Springs	Oreg.	29	1N	35E	3,925	12	5.2	9.5	0.0	9.9	-
Lucky Strike	Oreg.	28	3S	32E	5,050	9	11.4	16.4	10.0	15.3	-
Meacham	Oreg.	24,25	1S	35E	4,300	12	8.2	13.1	.5	12.9	-
Toll Gate	Oreg.	32	4N	38E	5,070	12	25.9	39.9	21.4	34.0	-
JOHN DAY RIVER BASIN											
Anthony Lake	Oreg.	18	7S	37E	7,125	12	26.2	36.0	30.6	31.4	-
Arbuckle Mountain	Oreg.	33	4S	29E	5,400	12	10.3	15.6	3.7	12.5	-
Beech Creek Summit	Oreg.	4	12S	30E	4,800	12	4.3	7.0	0.0	6.0	-
Blue Mountain Springs	Oreg.	21	15S	35E	5,900	12	14.7	22.0	10.4	14.9	-
Blue Mountain Summit	Oreg.	6	12S	36E	5,098	12	6.6	11.3	2.4	9.2	-
Derr	Oreg.	14	13S	23E	5,670	11	9.4	11.5	5.3	12.4	-
Dixie Springs	Oreg.	28	11S	34E	6,650	12	20.2	31.1	21.4	24.1	-
Gold Center	Oreg.	21	9S	36E	5,340	9	10.2	14.6	6.9	13.5	-
Izee Summit	Oreg.	28	16S	29E	5,293	12	6.5	8.9	1.6	10.1	-
Marks Creek	Oreg.	25	12S	19E	4,540	10	2.5	5.1	0.0	2.8	-
Olive Lake	Oreg.	14	9S	33E	6,000	12	17.5	23.9	19.7	30.0	-
Snow Mountain	Oreg.	1	19S	26E	6,300	4	12.0	17.7	9.7	19.0	-
Starr Ridge	Oreg.	20	15S	31E	5,150	12	3.7	7.5	.3	5.9	-
Tipton	Oreg.	34	10S	35E	5,100	10	9.0	16.1	1.0	9.0	-
DESCHUTES RIVER BASIN											
Caldwell Ranch	Oreg.	30	21S	8E	4,400	11	6.6	17.1	T	7.7	-
Cascade Summit	Oreg.	7	23S	6E	4,880	12	27.2	43.9	21.0	34.2	-1.2
Clear Lake	Oreg.	29	4S	9E	3,500	12	10.9	18.4	1.4	15.4	-
Crescent Lake	Oreg.	11	24S	6E	4,760	11	6.2	19.5	0.0	12.0	-
Derr	Oreg.	14	13S	23E	5,670	11	9.4	11.5	5.3	12.4	-
Hogg Pass	Oreg.	24	13S	7E	4,755	10	36.3	59.4	35.8	45.8	-
Marks Creek	Oreg.	25	12S	19E	4,540	10	2.5	5.1	0.0	2.8	-
New Dutchman Flat	Oreg.	21	18S	9E	6,400	7	43.2	-	-	52.2	+3.2
Ochocho Meadows	Oreg.	21	13S	20E	5,200	12	9.5	16.4	T	11.5	-
Rock Creek	Oreg.	1	4S	10E	4,200	2	13.8	21.4	6.2	17.3	-
Snow Mountain	Oreg.	1	19S	26E	6,300	4	12.0	17.7	9.7	19.0	-
Three Creeks Meadows	Oreg.	3	17S	9E	5,600	12	17.5	31.0	14.5	19.9	-
WILLAMETTE RIVER BASIN											
Breitenbush	Oreg.	21	9S	7E	2,325	5	0.8	3.9	-	4.6	-
Cascade Summit	Oreg.	7	23S	6E	4,880	12	27.2	43.9	21.0	34.2	-
Champion	Oreg.	12	23S	1E	4,500	9	20.7	48.4	10.1	36.6	-
Clackamas Lake	Oreg.	35	5S	8E	3,400	7	11.2	17.1	-	13.0	-
Hogg Pass	Oreg.	24	13S	7E	4,755	10	36.3	59.4	35.8	45.7	-
Marion Forks	Oreg.	28	11S	7E	2,730	7	6.9	18.0	3.4	10.4	-
Marys Peak	Oreg.	21	12S	7W	3,620	9	8.1	23.3	.4	13.2	-
McKenzie	Oreg.	35	15S	7E	4,800	8	33.6	65.8	-	46.6	-
Peavine Ridge	Oreg.	14,15	6S	7E	3,500	11	15.7	24.8	8.2	19.1	-
Phlox Point	Oreg.	6	3S	9E	5,600	10	53.9	90.9	54.2	68.7	+3.8
Santiam Junction	Oreg.	14	13S	7E	3,990	7	16.9	38.1	8.9	25.4	-
Still Creek	Oreg.	25	3S	8E	3,700	11	18.4	34.5	10.5	27.1	-5.6
Waldo Lake	Oreg.	15	21S	6E	5,500	11	24.9	47.1	24.9	29.0	-

Table 2.--Equivalent depth of water, in inches, determined by snow surveys about April 1--Continued

Snow course	State or Province	Lat. and Long. or Sec. Twp. Rge.			Elevation (feet)	Average prior to 1948		1946	1947	1948	Change during April 1948
						No. of years	Depth				
WHITE SALMON RIVER BASIN											
Cultus Creek	Wash.	35	7N	8E	4,000	3	44.8	71.2	-	44.8	-
Surprise Lakes	Wash.	14	7N	8E	4,250	4	47.5	77.8	39.7	47.8	-
LEWIS RIVER BASIN											
Cultus Creek	Wash.	35	7N	8E	4,000	3	44.8	71.2	-	44.8	-
Plains of Abraham	Wash.	35	9N	5E	4,700	4	64.8	109.7	50.7	60.2	-
Surprise Lakes	Wash.	14	7N	8E	4,250	4	47.5	77.8	39.7	47.8	-
COWLITZ RIVER BASIN											
Cayuse Pass	Wash.	15	16N	10E	5,300	7	77.2	139.5	86.8	94.0	-
White River Entrance	Wash.	4	16N	10E	3,550	7	15.3	33.1	13.3	22.9	-
WHITE RIVER BASIN											
Cayuse Pass	Wash.	15	16N	10E	5,300	7	77.2	139.5	86.8	94.0	-
Corral Pass	Wash.	30	18N	11E	6,000	8	34.6	53.8	45.0	52.0	-
Fog Basin	Wash.	32	17N	11E	5,600	9	41.4	70.1	41.8	53.7	-
White River Entrance	Wash.	4	16N	10E	3,550	7	15.3	33.1	13.3	22.9	-

## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

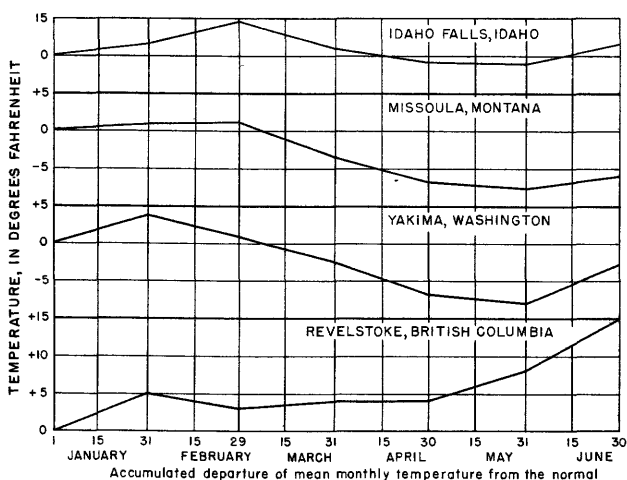
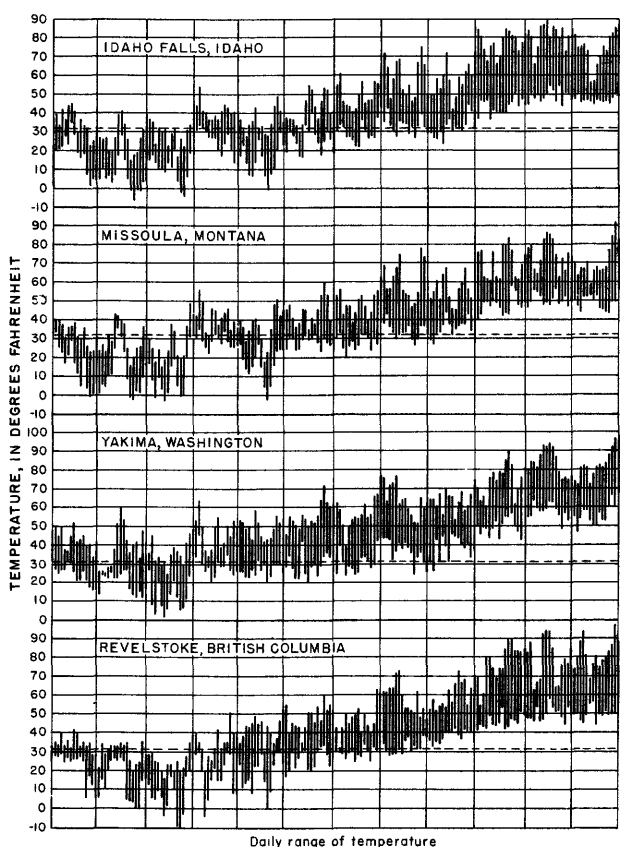


Figure 13.--Daily range of temperature and accumulated departure of mean monthly temperature from normal at various temperature stations of the United States Weather Bureau and the Meteorological Service, Dominion of Canada, in Columbia River Basin, January 1 to June 30, 1948.

Temperature

Temperature was a major factor in producing the flood of May-June 1948. Prior to May 15, subnormal temperatures prevailed throughout the basin. After May 15 temperatures rose rapidly and in general remained abnormally high. Normal snow melt during April and early May was prevented, and rapid melting of the snow was concentrated into a comparatively short period after May 15.

Temperature is discussed in the section "Meteorology," prepared by the staff of the United States Weather Bureau, and is discussed briefly as a flood-producing factor in other preceding sections of this report.

Figure 13 shows the daily range in temperature and the accumulated departure of monthly mean temperature from normal at various stations of the United States Weather Bureau and the Meteorological Service, Dominion of Canada, in Columbia River Basin for the period January 1 to June 30, 1948.

Preceding sections of the report have compared other features of the floods in 1894 and 1948. Figure 14 shows a comparison of daily range in temperature for the period April 1 to June 30 in the years 1894 and 1948 at various United States Weather Bureau temperature stations in the basin.

DETERMINATION OF FLOOD DISCHARGES

The general methods employed by the Geological Survey in the determinations of maximum flood discharges at regular river-measurement stations and at locations where regular river-measurement stations are not maintained have been described in detail in several water-supply papers relating to floods, and repetition of the description in this report is deemed unnecessary.

At the regular river-measurement stations operations consist principally of the determination of a stage-discharge relation from which, under normal conditions and from a known stage, the discharge can be determined. At other places or for stages in excess of those defined by the stage-discharge relation, determinations of maximum flow have been based chiefly on (1) computation of flow over dams, (2) computation of flow from slope-area observations, and (3) computation of flow through contracted openings. Examples and general information in regard to the use of these methods with special references to the conditions experienced by the Geological Survey in applying them to various severe floods are given in Water-Supply Papers 773-E, 796-G, 798, 799, 800, 816, 843, and 888.

STAGES AND DISCHARGES AT STREAM-GAGING STATIONSExplanation of data

One of the foremost purposes of this report is the publication of useful detailed information regarding the stages and discharges of streams during the floods of May-June 1948 that will not be available in the summarized records of river discharge published annually in the water-supply papers of the Geological Survey. The justification for making available such detailed information rests upon the recognized need for records of flood behavior that will show not only the mean daily discharge and the maximum rates of discharge during a flood as usually published for a gaging station but also the stages and rates of discharge at frequent times throughout the flood period.



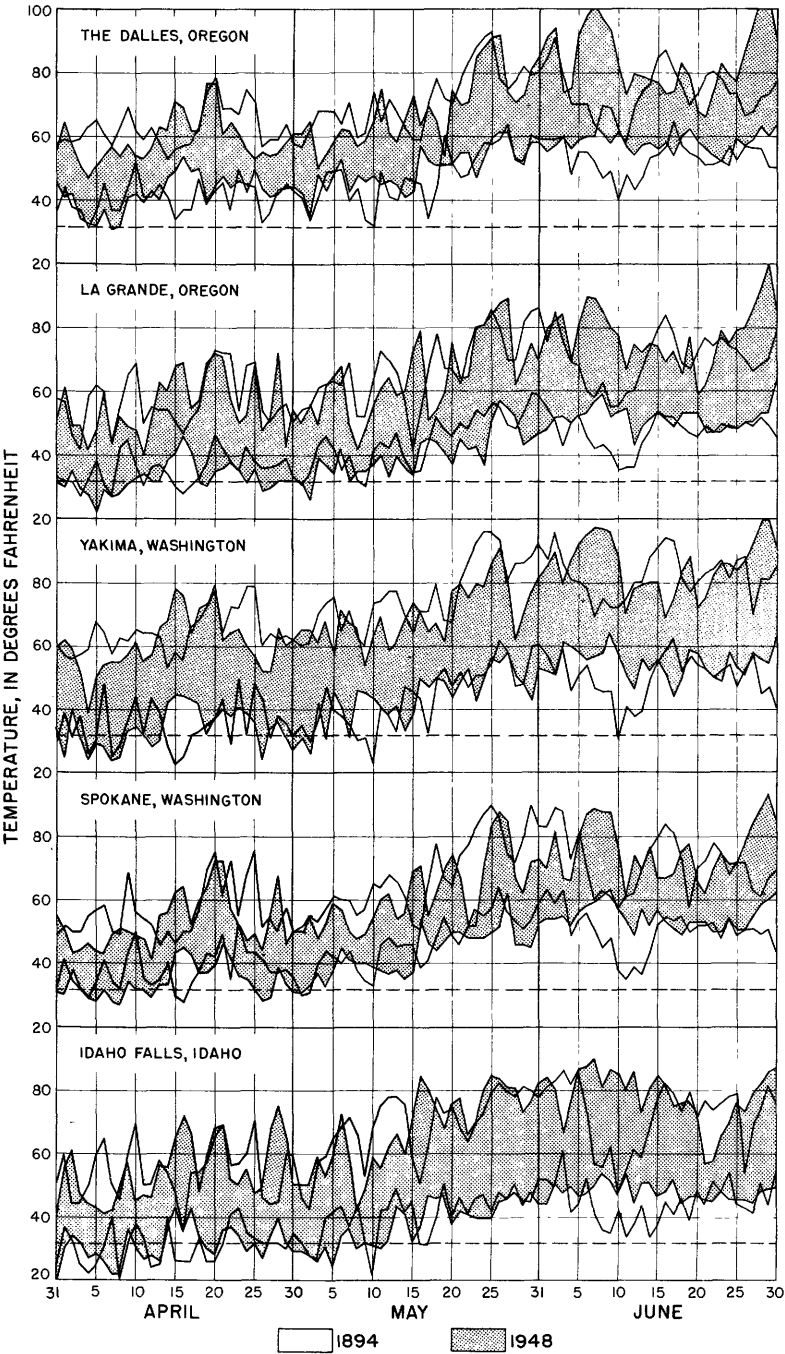


Figure 14.--Daily range of temperatures at various temperature stations of the United States Weather Bureau in Columbia River Basin, April 1 to June 30, 1894 and 1948.

Such records also will make possible a definition of conditions of stage and discharge at all stations in a basin at a given time during the progress of the flood. This detail is essential for intensive and comprehensive studies of the characteristics of floods and promotes the formulation of appropriate plans for flood protection and control. It furnishes basic information for studying the behavior of flood crests, including the incidence of crests from different tributaries of a stream, the progress of flood crests throughout a river system, and other features useful in deriving the elements necessary for forecasting flood heights and for appraising the characteristics of different basins in the shedding of flood waters. It furnishes basic information for the consideration of the feasibility of reservoirs, channel improvement, forest management, soil treatment, flood forecasting, and other measures with respect to their merits for ameliorating damage and losses caused by floods. Moreover, in view of the record-setting character of the floods of May-June 1948, it is important that full and authentic information concerning them be available for reference and guidance in connection with future urban and industrial development, with highway and bridge construction, and especially with the design of hydraulic structures in their relation to flood channels of streams.

In general, records of gaging stations published in this report relate to streams on which floods occurred or which are situated adjacent to the margins of the flooded regions and so serve to define the areal extent of the floods.

The basic data systematically collected at stream-gaging stations consist of records of stage, measurements of discharge, and general information useful in determining the daily flow from the records of gage heights and discharge measurements. The records of stage are obtained either by periodic direct readings on a nonrecording gage or by a water-stage recorder which provides a continuous graph of stage. Measurements of discharge are generally made by a current meter, the methods of use of which are outlined in standard textbooks. Occasionally determination of extraordinary peak flows must be made by auxiliary methods referred to in the preceding section of this report. A typical stream-gaging station is usually equipped with a water-stage recorder and cableway and a suspended car from which discharge measurements are made. Rating tables showing the discharges for indicated stages are prepared from the results of discharge measurements. At some river stations other or auxiliary devices are used in the determination of discharge, such as artificial controls, turbines, venturi meters, and gates, so calibrated as to indicate rates of discharge.

The data presented in the following tables comprise, in general, for each stream-gaging station a description of the station, a table showing the daily discharges throughout the 3-month period May to July 1948, and a table showing the stage and discharge at the indicated time during the period of major flood flow, generally May 17 to June 21, which is sufficiently detailed to permit the delineation of reasonably accurate graphs of the instantaneous stage and discharge for the flood period. The data are intended to be reasonably complete and explicit with respect to essential information, although they are presented in concise form.

The description of the station gives information concerning the type, location, and datum of the gage, the area of the drainage basin, and the record of gage heights. The information regarding gage heights describes the method of determining the stage during the flood and is of special technical significance, because the flood conditions

at some localities prevented the use of the usual method of obtaining records of stage and discharge. A statement regarding the stage-discharge relation explains briefly the methods used in the definition of the rating curve over the ranges of stage occurring in the floods of May-June 1948 as well as of the previous maximum flood of record and gives information on conditions that affected the stage-discharge relation. The description also includes information with respect to other auxiliary methods used in obtaining the discharge. The maximum stage and discharge at the gaging station are given for the floods of May-June 1948 and for the indicated period of record prior thereto, also at some stations for floods antedating such period of record. Miscellaneous notes and comments essential or helpful to an understanding of the record are included as remarks.

The table of mean daily discharge presents the data generally for May, June, and July, which cover not only the period of the flood but also a time of sufficient length before and after the peak to show the relation of the flood discharges to the prevalent discharges of the preceding and following periods, thus giving a general perspective of the stream-flow conditions prior to, throughout, and subsequent to the flood rise. The table shows the mean monthly discharge for the 3 months and the volume of runoff expressed in depth in inches over the drainage area. Figures 15, 16, and 17 show hydrographs of mean daily discharge at 25 selected stream-gaging stations for this 3-month period.

The tables showing stage and discharge at indicated times are designed to present the rise and recession of the flood in detail. In general each table begins on May 17, well before the beginning of the major flood rise, and continues through June 21, when the flood had largely passed out of the river systems. Standard time is used. This table is accompanied by supplemental records of stage and discharge when necessary to afford an adequate record for the given river-measurement station. Hydrographs of discharge showing characteristics of the flood peaks and conditions of stream flow during the period May to July are presented for stream-gaging stations on the main stem of the Columbia River in figure 18.

The stages at indicated times were obtained from records of continuous water-stage recorders, so far as such records were available. For stations at which the records were broken because of some failure in the recording system the method of computing the missing periods has been explained in the section of the description concerning gage heights or discharge. For stations at which the records of stage consisted of only one or more gage readings per day, the stages at indicated times generally represent such readings, unless otherwise explained.

The following tables present, for several reservoirs, records of stage and storage content through the flood period in a form similar to the data for the stream-gaging stations. These records are of special value in showing the influence of storage reservoirs on flood flows, in relation both to the appraisal of their effect on flood flows and to the extending of information on the natural characteristics of drainage basins in the shedding of flood waters.

The records are presented in the order regularly used by the Geological Survey in its water-supply papers. Records for gaging stations on the main streams are presented first, in downstream order, and then stations on tributaries in similar order beginning with the uppermost. The table of contents lists the stations in the order in which

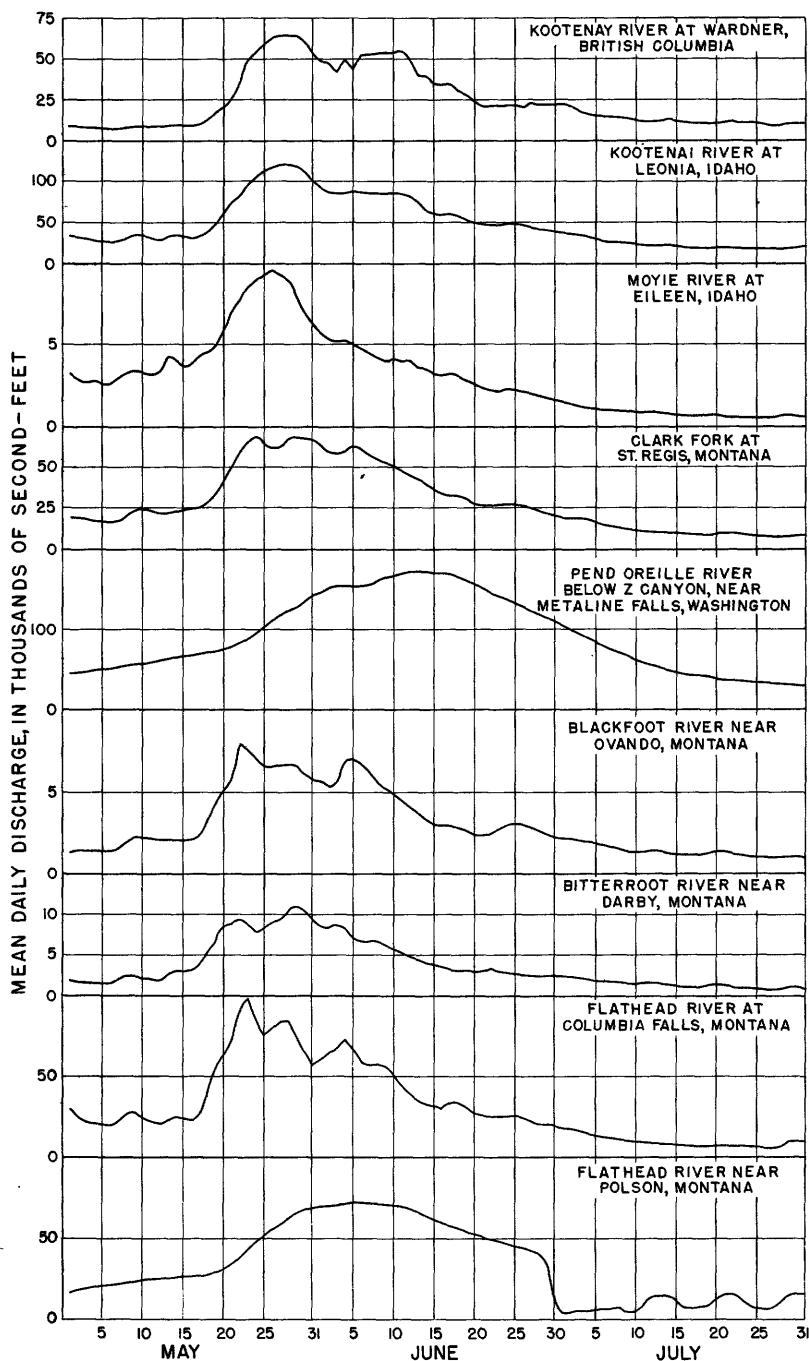


Figure 15.--Graphs of mean daily discharge at various river-measurement stations in Kootenai and Pend Oreille River Basins, May 1 to July 31, 1948.

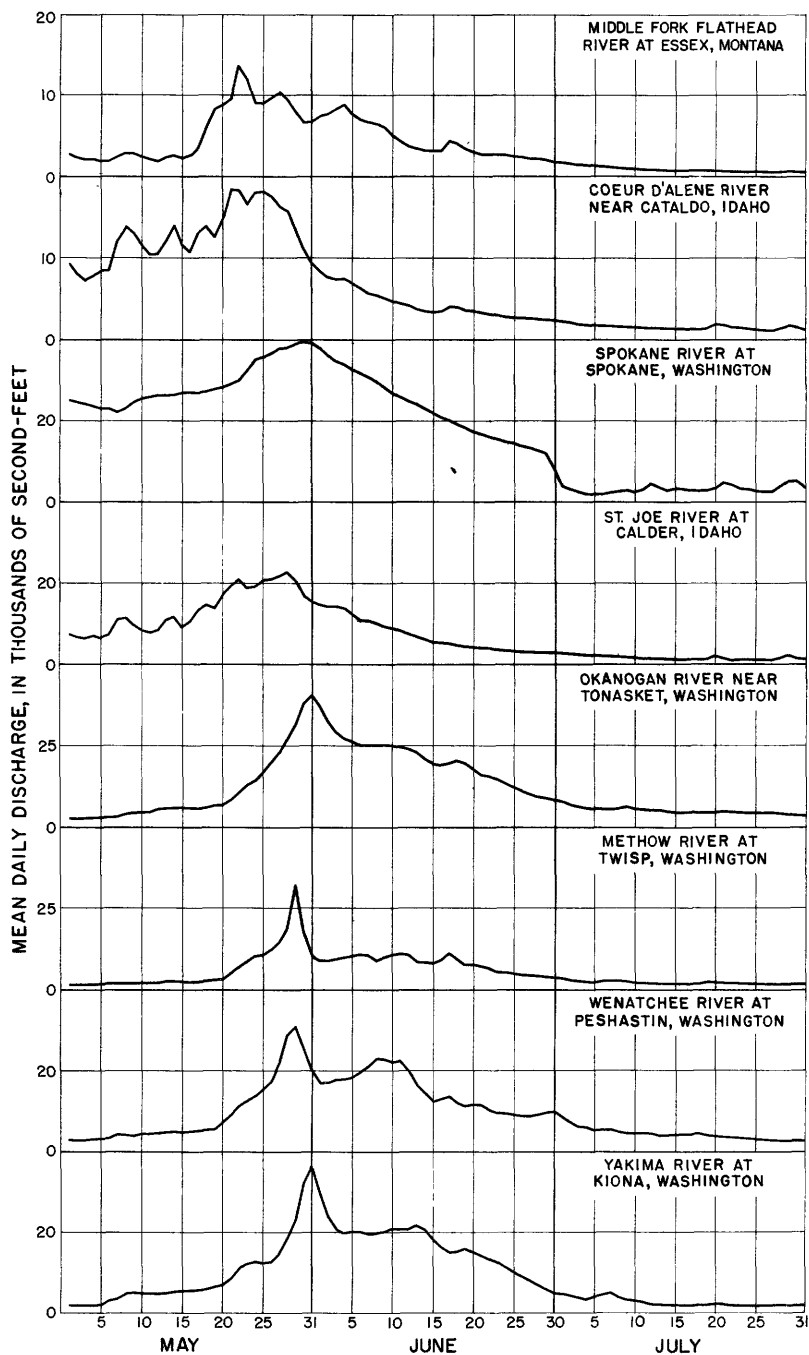


Figure 16.--Graphs of mean daily discharge at various river-measurement stations in upper Columbia River Basin, May 1 to July 31, 1948.

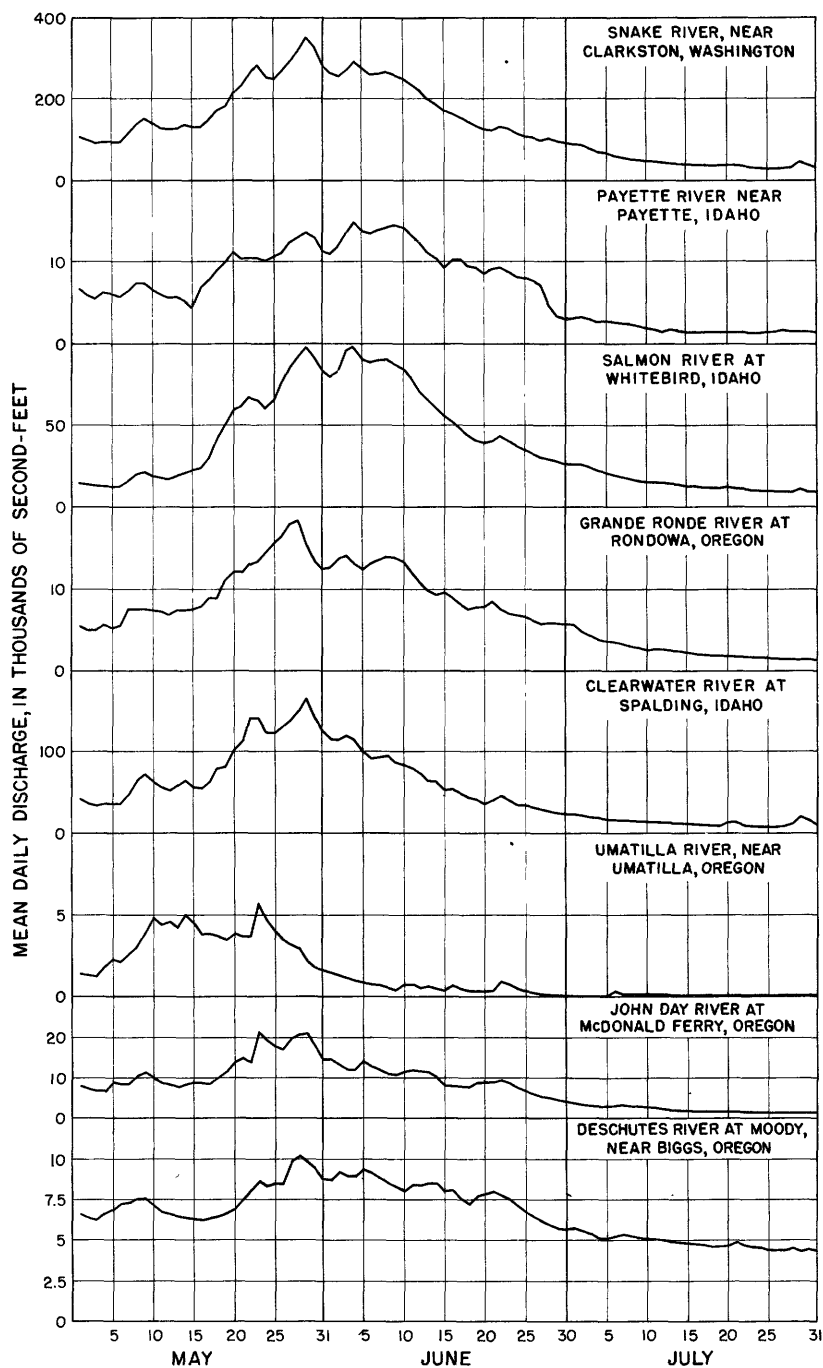


Figure 17.--Graphs of mean daily discharge at various river-measurement stations in Snake and lower Columbia River Basins, May 1 to July 31, 1948.

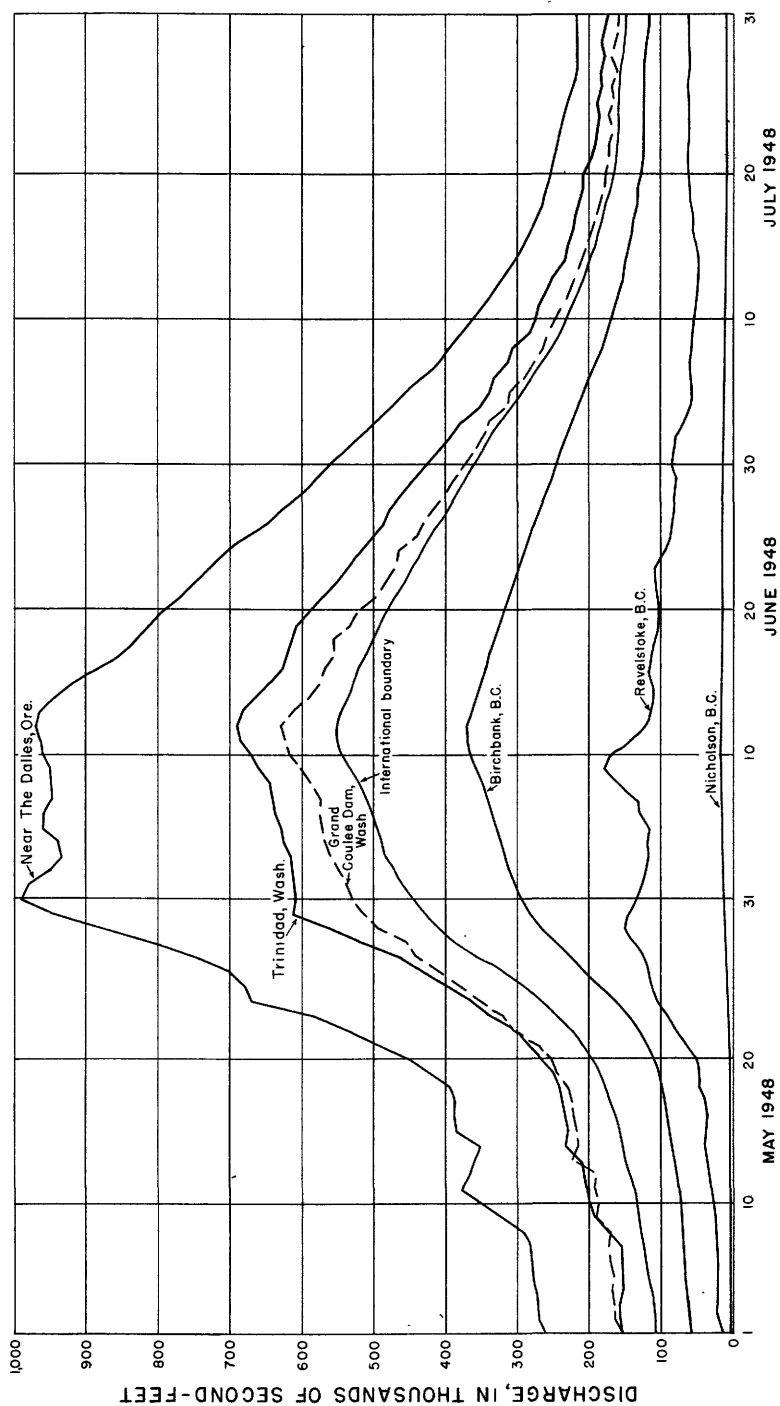


Figure 1B.—Graphs of mean daily discharge at various river-measurement stations on Columbia River, May 1 to July 31, 1948.

they appear herein; the index presents them alphabetically by stream and place names.

The maximum discharges at these stream-gaging stations and at other places on these streams, with other related information, are listed in table 3. The stations are identified on plate 6 (in pocket) by means of the index numbers shown in the first column of the table.

Reference should be made to the water-supply papers of the Geological Survey for other available published records of flow of the streams discussed in this report.



## Columbia River Main Stem

## Columbia River at Nicholson, British Columbia

Location.- Lat. 116°56'00", long. 51°14'10", at highway bridge about 100 yards west of Canadian Pacific Railway tracks, 5 miles south of Golden. Datum of gage is 2,563.89 feet above mean sea level, datum of Geodetic Survey of Canada, adjustment of 1928.

Drainage area.- 2,490 square miles.

Gage-height record.- Staff gage read once or twice daily.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 19,400 second-feet June 11, 1948 (gage height, 13.60 feet).

1903-29 (Golden), 1929 to April 1948 (Nicholson): Discharge, 23,700 second-feet June 25, 1916 (gage height, 12.50 feet, at Golden).

Remarks.- Records furnished by Dominion Water and Power Bureau, Department of Mines and Resources, Canada.

## Mean discharge, in second-feet, 1948

Monthly mean discharge, in second-feet											
Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2,330	14,900	13,500	11	2,630	19,400	10,300	21	4,980	14,800	7,880
2	2,630	15,500	13,300	12	2,680	19,200	9,910	22	5,730	14,800	7,800
3	2,530	15,900	13,200	13	2,850	18,600	9,490	23	6,670	14,800	7,880
4	2,430	16,200	13,100	14	2,960	17,900	9,160	24	7,640	14,900	8,040
5	2,430	16,600	12,600	15	3,050	16,900	8,840	25	8,520	14,900	8,200
6	2,330	16,800	12,400	16	3,060	16,400	8,520	26	9,160	14,800	8,330
7	2,280	17,300	11,900	17	3,120	15,900	8,280	27	10,000	14,600	8,360
8	2,330	17,900	11,500	18	3,510	15,600	8,040	28	10,800	14,300	8,280
9	2,480	18,300	11,200	19	4,100	15,300	7,880	29	11,600	14,100	8,200
10	2,530	19,000	10,800	20	4,460	15,000	7,880	30	12,600	13,800	8,040
								31	13,900		7,850
Monthly mean discharge, in second-feet									5,110	16,100	9,700
Runoff, in inches									2.36	7.22	4.50

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 17			May 26			June 4			June 13	
8a	3.55	3,120	8a	7.90	9,160	8	11.90	16,200	8a	13.20	18,600
	May 18			May 27		N	11.85	16,100		June 14	
8a	3.90	3,510	8a	8.40	10,000	1	11.87	16,200	8a	12.80	17,900
	May 19			May 28		8a	12.10	16,600		June 15	
8a	4.40	4,100	8a	8.85	10,800		June 6		8a	12.30	16,900
	May 20			May 29		8a	12.25	16,800		June 16	
8a	4.70	4,460	8a	9.35	11,600		June 7		8a	12.00	16,400
	May 21			May 30		8a	12.50	17,300		June 17	
8a	5.10	4,980	8a	9.90	12,600		June 8		8a	11.70	15,900
	May 22			May 31		8a	12.80	17,900		June 18	
8a	5.65	5,730	8a	10.60	13,900		June 9		8a	11.55	15,600
	May 23			June 1		8a	13.05	18,300		June 19	
8a	6.30	6,670	8a	11.15	14,900		June 10		8a	11.40	15,300
	May 24			June 2		8a	13.40	19,000		June 20	
8a	6.95	7,640	8a	11.50	15,500		June 11		8a	11.25	15,000
	May 25			June 3		8a	13.60	19,400	4:30	11.20	15,000
8a	7.50	8,520	8a	11.70	15,900		June 12			June 21	
						8a	13.50	19,200	8a	11.10	14,800
									4:30	11.10	14,800

## Columbia River at Revelstoke, British Columbia

**Location.**- Lat. 50°58'24", long. 118°13'24", at highway bridge about 70 yards downstream from Canadian Pacific Railway bridge, 1 mile west of Revelstoke. Datum of gage is 1,422.94 feet above mean sea level, datum of Geodetic Survey of Canada, adjustment of 1928.

**Drainage area.**- 9,000 square miles.

**Gage-height record.**- Wire-weight gage read once or twice daily.

**Discharge record.**- Stage-discharge relation defined by current-meter measurements.

Gage heights used to hundredths.

**Maxima.**- May-June 1948: Discharge, 178,000 second-feet June 9 (gage height, 22.49 feet).

1911-22, 1928 to April 1948: Discharge, 171,000 second-feet July 18, 1920 (gage height, 21.1 feet).

Flood of 1894 reached a stage of 23.55 feet (discharge, 215,000 second-feet).

**Remarks.**- Records furnished by Dominion Water and Power Bureau, Department of Mines and Resources, Canada.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July*
1	13,800	125,000	82,400	11	29,800	140,000	52,500	21	60,600	105,000	83,700
2	19,200	120,000	80,200	12	32,600	120,000	51,000	22	78,400	106,000	83,400
3	20,400	115,000	69,100	13	35,200	113,000	49,200	23	90,100	108,000	82,600
4	20,300	118,000	58,200	14	38,200	109,000	47,800	24	108,000	94,300	62,200
5	19,800	117,000	56,700	15	35,400	112,000	51,600	25	112,000	87,200	61,600
6	19,800	132,000	59,300	16	34,600	115,000	54,500	26	117,000	85,300	61,200
7	20,700	136,000	61,400	17	37,300	114,000	55,700	27	123,000	82,900	60,400
8	21,000	161,000	57,900	18	44,200	107,000	58,900	28	138,000	80,300	60,100
9	23,500	178,000	55,700	19	44,800	103,000	60,800	29	148,000	79,200	60,100
10	26,100	170,000	54,700	20	49,000	103,000	62,100	30	144,000	84,100	60,500
								31	133,000		60,900
Monthly mean discharge, in second-feet .....									59,300	114,000	59,900
Runoff, in inches .....									7.60	14.14	7.68

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
8a	May 17 10.54	37,300	8a	May 27 18.88	123,000	8a	June 6 19.58	132,000	8	June 15 18.02	111,000
									4:30	18.11	112,000
8a	May 18 11.53	44,200	8a	May 28 20.00	139,000	8a	June 7 19.84	136,000		June 16 18.37	116,000
									8	18.26	114,000
8a	May 19 11.60	44,800	8a	May 29 20.66	148,000	8a	June 8 21.46	161,000	4:30	June 17 18.27	114,000
									8	18.23	114,000
8a	May 20 12.17	49,000	8a	May 30 20.37	144,000	8a	June 9 22.49	178,000	4:30	June 18 17.72	107,000
									8	17.75	108,000
8a	May 21 13.57	60,600	8a	May 31 19.63	133,000	8a	June 10 22.00	170,000	4:30	June 19 17.43	103,000
									8	17.38	103,000
8a	May 22 15.35	78,400	8a	June 1 19.03	125,000	8a	June 11 20.08	140,000	4:30	June 20 17.35	102,000
									8	17.42	103,000
8a	May 23 16.36	90,100	8a	June 2 18.66	120,000	8a	June 12 18.68	120,000		June 21 17.57	105,000
									4:30	17.61	106,000
8a	May 24 17.79	108,000	8a	June 3 18.33	115,000	8a	June 13 18.16	115,000			
									8		
8a	May 25 18.13	112,000	8a	June 4 18.52	118,000	8a	June 14 17.86	109,000	4:30		
									8		
8a	May 26 18.44	117,000	8a	June 5 18.45	117,000						

Columbia River at Birchbank, British Columbia  
(International gaging station)

**Location.**- Lat. 49°11', long. 117°42', at Birchbank, British Columbia, 7 miles upstream from Trail, 11 miles downstream from Kootenai River, and 17 miles upstream from international boundary. Datum of gage is 1,329.909 feet above mean sea level, datum of Geodetic Survey of Canada, adjustment of 1947.

**Drainage area.**- 34,000 square miles.

**Gage-height record.**- Water-stage recorder graph except period July 7-31, when gage heights at Trail were used.

**Discharge record.**- Gage heights used to hundredths.

**Maxima.**- May-June 1948: Discharge, 370,000 second-feet 4 p.m. June 11 (gage height, 50.82 feet; gage height, 46.17 feet, at Trail).

1913 to April 1948: Discharge, 312,000 second-feet June 14, 15, 1913 (gage height, 41.6 feet, at Trail).

**Remarks.**- Small diversions above station for irrigation. Flow affected by partial regulation of Kootenai River in Kootenay Lake. This station is one of the international gaging stations maintained by Canada under agreement with the United States.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	57,000	303,000	238,000	11	74,300	369,000	162,000	21	120,000	310,000	124,000
2	58,900	310,000	231,000	12	77,000	369,000	157,000	22	131,000	303,000	124,000
3	60,300	317,000	224,000	13	80,500	363,000	152,000	23	146,000	297,000	123,000
4	62,500	323,000	215,000	14	83,700	356,000	148,000	24	164,000	289,000	124,000
5	64,000	328,000	206,000	15	86,000	349,000	143,000	25	185,000	283,000	123,000
6	65,200	334,000	198,000	16	89,000	343,000	140,000	26	205,000	275,000	123,000
7	67,000	339,000	189,000	17	93,100	338,000	137,000	27	227,000	266,000	122,000
8	68,600	347,000	180,000	18	97,500	331,000	134,000	28	249,000	258,000	122,000
9	70,300	355,000	175,000	19	102,000	324,000	133,000	29	268,000	250,000	120,000
10	72,200	365,000	169,000	20	109,000	317,000	126,000	30	282,000	244,000	117,000
								31	294,000		116,000
Monthly mean discharge, in second-feet									122,900	318,500	154,700
Runoff, in inches									4.17	10.45	5.24

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
May 17												
4	20.52	92,100	21.17	96,100	21.86	100,000	22.77	106,000	24.23	116,000	25.79	127,000
8	20.61	92,700	21.26	96,700	21.95	101,000	22.98	107,000	24.40	117,000	26.03	129,000
N	20.67	92,700	21.50	98,100	22.15	102,000	23.22	109,000	24.75	120,000	26.34	132,000
4	20.78	92,700	21.51	98,200	22.23	103,000	23.41	110,000	24.84	120,000	26.64	134,000
8	20.96	94,800	21.62	98,800	22.60	105,000	23.65	112,000	25.18	123,000	26.79	135,000
12	21.07	95,400	21.78	99,800	22.68	106,000	24.07	115,000	25.49	125,000	27.16	138,000
May 23												
4	27.48	140,000	29.74	158,000	31.90	178,000	34.30	200,000	36.36	221,000	38.55	242,000
8	27.86	143,000	30.10	162,000	32.31	181,000	34.65	204,000	36.70	224,000	38.90	246,000
N	28.14	145,000	30.40	164,000	32.67	185,000	34.96	207,000	37.00	227,000	39.23	249,000
4	28.57	149,000	30.76	167,000	33.08	188,000	35.14	208,000	37.36	231,000	39.60	253,000
8	28.92	152,000	31.10	170,000	33.46	192,000	35.52	212,000	37.71	234,000	39.89	256,000
12	29.37	155,000	31.50	174,000	33.89	196,000	35.96	217,000	38.21	239,000	40.25	259,000
May 29												
4	40.60	263,000	42.06	278,000	43.31	291,000	44.20	301,000	44.97	309,000	45.64	316,000
8	40.88	266,000	42.27	280,000	43.46	293,000	44.36	302,000	45.05	310,000	45.76	317,000
N	41.12	267,000	42.48	282,000	43.65	295,000	44.41	303,000	45.11	310,000	45.80	317,000
4	41.35	271,000	42.70	285,000	43.82	297,000	44.56	304,000	45.30	312,000	45.87	318,000
8	41.55	273,000	42.85	286,000	43.90	297,000	44.71	306,000	45.46	314,000	46.00	320,000
12	41.82	276,000	43.10	289,000	44.02	299,000	44.82	307,000	45.55	315,000	46.12	321,000
June 4												
4	46.23	322,000	46.75	327,000	47.20	332,000	47.70	338,000	48.24	344,000	49.00	352,000
8	46.32	323,000	46.81	328,000	47.27	333,000	47.75	339,000	48.36	345,000	49.09	353,000
N	46.38	323,000	46.86	328,000	47.30	333,000	47.81	339,000	48.50	346,000	49.28	355,000
4	46.46	324,000	46.87	328,000	47.35	334,000	47.90	340,000	48.63	348,000	49.34	356,000
8	46.60	326,000	47.00	330,000	47.48	335,000	48.02	341,000	48.79	349,000	49.40	356,000
12	46.65	326,000	47.13	331,000	47.61	337,000	48.13	342,000	48.90	351,000	49.50	358,000
June 10												
4	49.82	361,000	50.56	369,000	50.59	369,000	50.19	365,000	49.60	359,000	48.90	351,000
8	50.03	363,000	50.58	369,000	50.56	369,000	50.08	364,000	49.47	357,000	48.75	349,000
N	50.21	365,000	50.57	369,000	50.51	369,000	49.99	363,000	49.34	356,000	48.67	348,000
4	50.35	367,000	50.62	370,000	50.42	368,000	49.95	362,000	49.26	355,000	48.72	349,000
8	50.48	368,000	50.61	370,000	50.36	367,000	49.81	361,000	49.17	354,000	48.52	347,000
12	50.51	369,000	50.60	370,000	50.28	366,000	49.74	360,000	49.01	352,000	48.39	345,000
June 16												
4	48.30	344,000	47.82	339,000	47.28	333,000	46.62	326,000	45.89	318,000	45.30	312,000
8	48.20	343,000	47.72	338,000	47.15	332,000	46.54	325,000	45.88	318,000	45.21	311,000
N	48.14	343,000	47.67	337,000	46.98	330,000	46.35	323,000	45.74	317,000	45.09	310,000
4	48.10	342,000	47.56	336,000	46.98	330,000	46.28	322,000	45.62	316,000	44.97	309,000
8	48.11	342,000	47.45	335,000	46.85	328,000	46.20	322,000	45.51	315,000	44.86	308,000
12	47.96	341,000	47.40	334,000	46.74	327,000	46.00	320,000	45.40	313,000	44.75	306,000

Columbia River at international boundary  
(International gaging station)

**Location.**- Lat. 49°00'03", long. 117°37'40", in SE $\frac{1}{4}$  sec. 4, T. 40 N., R. 41 E., at international boundary, half a mile downstream from Pend Oreille River. Auxiliary water-stage recorder 2.2 miles downstream. Datum of gage is at mean sea level (Bureau of Reclamation 1937 datum).

**Drainage area.**- 59,700 square miles.

**Gage-height record.**- Water-stage recorder graphs from base and auxiliary gages.

**Discharge record.**- Computed by normal-fall method. Stage-fall-discharge relations defined by current-meter measurements. Gage heights used to hundredths.

**Maxima.**- May-June 1948: Discharge, 550,100 second-feet 6 a.m. June 12 (elevation, 1,338.13 feet).

1938 to April 1948: Discharge, 360,200 second-feet June 6, 1946 (elevation, 1,326.08 feet).

**Remarks.**- Small diversions above station for irrigation. Flow affected by regulation in Kootenai and Pend Oreille River Basins. This station is one of the international gaging stations maintained by the United States under agreement with Canada. Records provisional, subject to revision.

*Mean discharge, in second-feet, 1948*

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	106,600	459,100	348,300	11	138,500	548,600	221,000	21	209,000	466,700	162,400
2	108,700	470,100	336,900	12	142,400	548,500	211,700	22	222,800	455,200	160,100
3	111,200	481,400	321,300	13	149,700	542,400	203,600	23	241,100	445,600	158,700
4	116,100	488,800	306,700	14	154,100	533,400	196,000	24	264,700	434,000	158,000
5	118,300	494,300	291,200	15	157,600	525,200	190,300	25	290,000	422,200	157,900
6	120,500	499,200	276,200	16	162,800	516,900	186,500	26	318,900	409,100	156,800
7	125,100	506,700	263,100	17	169,700	509,600	181,700	27	353,200	395,600	155,600
8	127,800	516,600	250,800	18	175,800	499,300	177,500	28	386,500	383,900	153,800
9	131,100	527,400	238,600	19	182,600	489,600	172,000	29	409,300	371,600	150,700
10	134,800	541,900	229,400	20	194,700	477,900	165,800	30	426,400	360,300	147,500
								31	443,900		145,800
Monthly mean discharge, in second-feet.....									206,300	477,400	208,900
Runoff, in inches.....									3.98	8.92	4.03

Elevation\*, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	11.23	187,700	11.83	174,200	12.36	180,100	13.29	190,500	14.60	205,200	15.69	218,300
8	11.34	168,700	11.90	175,000	12.45	181,100	13.45	192,300	14.77	207,200	15.88	220,500
N	11.43	169,700	12.00	176,000	12.54	182,000	13.70	194,900	14.97	209,500	16.09	223,000
4	11.49	170,400	12.07	176,800	12.67	183,500	13.81	196,100	15.03	210,300	16.32	225,600
8	11.66	172,200	12.12	177,300	12.87	185,600	14.05	198,900	15.25	212,900	16.43	227,000
12	11.70	172,600	12.25	178,600	13.10	188,100	14.38	202,700	15.47	215,400	16.68	229,900
	May 23		May 24		May 25		May 26		May 27		May 28	
4	16.93	233,000	18.79	255,900	20.73	281,200	22.83	310,200	25.06	344,400	27.15	377,200
8	17.25	237,000	19.25	261,700	21.00	284,900	23.16	315,000	25.36	348,800	27.55	383,500
N	17.52	240,800	19.51	265,000	21.34	289,900	23.42	318,700	25.66	353,200	27.80	387,500
4	17.89	245,500	19.79	268,700	21.68	294,500	23.74	323,400	25.97	357,900	28.03	391,000
8	18.20	249,400	20.05	272,500	21.98	298,600	24.02	327,200	26.30	363,100	28.30	395,100
12	18.43	252,400	20.36	276,700	22.42	304,600	24.47	333,700	26.74	370,000	28.58	399,400
	May 29		May 30		May 31		June 1		June 2		June 3	
4	28.81	403,600	29.90	420,200	31.10	438,200	32.14	454,600	32.99	467,300	33.71	479,400
8	29.07	407,400	30.12	423,500	31.33	442,100	32.33	457,500	33.05	468,300	33.79	480,600
N	29.26	410,300	30.31	426,700	31.50	444,600	32.48	459,700	33.15	469,900	33.86	481,800
4	29.35	411,500	30.45	428,900	31.68	447,300	32.60	461,500	33.24	471,300	33.88	482,100
8	29.50	414,300	30.69	432,500	31.73	448,100	32.67	463,000	33.34	472,900	33.97	483,500
12	29.75	417,900	30.85	434,900	31.94	451,200	32.82	465,300	33.54	476,100	34.10	485,600
	June 4		June 5		June 6		June 7		June 8		June 9	
4	34.20	487,200	34.57	493,100	34.86	497,800	35.28	504,500	35.85	513,600	36.52	524,300
8	34.25	488,000	34.60	493,600	34.90	498,400	35.36	505,800	35.94	515,000	36.61	525,800
N	34.33	489,300	34.66	494,600	34.96	499,400	35.42	506,700	36.06	517,000	36.71	527,400
4	34.34	489,400	34.66	494,600	34.95	499,200	35.42	506,700	36.10	517,600	36.81	529,000
8	34.40	490,400	34.72	495,500	35.03	500,500	35.57	509,100	36.21	519,400	36.91	530,600
12	34.50	492,000	34.78	496,500	35.18	502,900	35.72	511,500	36.40	522,400	37.01	532,200
	June 10		June 11		June 12		June 13		June 14		June 15	
4	37.20	535,200	38.00	548,000	38.11	549,800	37.82	545,100	37.25	536,000	36.75	528,000
8	37.54	540,800	38.03	548,500	38.10	549,600	37.72	543,500	37.20	535,200	36.68	526,900
N	37.69	543,000	38.05	548,800	38.05	548,800	37.67	542,700	37.10	533,600	36.56	525,000
4	37.84	545,400	38.02	548,300	38.02	548,300	37.62	541,900	37.00	532,000	36.50	524,000
8	37.94	547,000	38.08	549,300	37.93	546,900	37.45	539,200	36.90	530,400	36.40	522,400
12	37.98	547,700	38.07	549,100	37.89	546,200	37.35	537,600	36.80	528,800	36.33	521,300
	June 16		June 17		June 18		June 19		June 20		June 21	
4	36.22	519,000	35.81	515,000	35.31	504,000	34.60	493,600	33.87	481,400	33.21	470,500
8	36.13	517,600	35.77	512,300	35.20	501,700	34.50	492,000	33.84	480,900	33.13	468,700
N	36.06	516,500	35.64	509,700	35.00	498,500	34.40	489,900	33.69	478,000	33.03	467,100
4	36.04	516,100	35.45	508,700	34.90	496,900	34.26	487,700	33.56	478,000	32.89	465,000
8	35.95	514,700	35.44	506,500	34.78	495,000	34.11	485,300	33.43	473,500	32.76	463,000
12	35.90	513,900	35.36	505,300	34.73	494,200	34.03	484,000	33.29	471,200	32.66	461,000

**Supplemental record.**- June 12, 6 a.m., 1,338.13 ft., 550,100 sec.-ft.

\* Add 1,300.00 feet to obtain elevation above mean sea level.

## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

Franklin D. Roosevelt Lake at Grand Coulee Dam, Wash.

Location.- Lat. 47°57'20", long. 118°59'10", in lot 3, sec. 1, T. 28 N., R. 30 E., in block 12 of Grand Coulee Dam at Grand Coulee. Datum of gage is at mean sea level (levels by Bureau of Reclamation).

Drainage area.- 74,100 square miles.

Gage-height record.- Water-stage recorder graph.

Remarks.- Reservoir formed by concrete dam; capacity, 5,118,000 acre-feet between elevations 1,208 feet (lower limit of operation) and 1,288 feet (top of gates). Dead storage, 4,371,000 acre-feet. Figures given herein represent total contents. Gage-height record and reservoir areas furnished by Bureau of Reclamation.

Elevation, in feet, and contents, in acre-feet, at 12 p.m. of indicated day

Day	May		June		July	
	Elevation	Acre-feet	Elevation	Acre-feet	Elevation	Acre-feet
1	1,288.9	9,563,700	1,290.0	9,655,000	1,289.9	9,646,700
2	1,288.9	9,563,700	1,290.0	9,655,000	1,290.0	9,655,000
3	1,288.7	9,547,100	1,289.9	9,646,700	1,289.9	9,646,700
4	1,289.0	9,572,000	1,290.0	9,655,000	1,289.9	9,646,700
5	1,289.1	9,580,300	1,290.0	9,655,000	1,289.9	9,646,700
6	1,289.2	9,588,600	1,289.9	9,646,700	1,289.9	9,646,700
7	1,289.6	9,621,800	1,290.0	9,655,000	1,289.9	9,646,700
8	1,290.0	9,655,000	1,290.0	9,655,000	1,289.9	9,646,700
9	1,290.0	9,655,000	1,290.0	9,655,000	1,290.0	9,655,000
10	1,290.0	9,655,000	1,290.1	9,663,300	1,289.9	9,646,700
11	1,289.9	9,646,700	1,290.1	9,663,300	1,289.9	9,646,700
12	1,290.0	9,655,000	1,290.0	9,655,000	1,289.9	9,646,700
13	1,289.7	9,630,100	1,289.9	9,646,700	1,289.9	9,646,700
14	1,289.7	9,630,100	1,289.9	9,646,700	1,289.9	9,646,700
15	1,289.9	9,646,700	1,290.0	9,655,000	1,289.9	9,646,700
16	1,289.8	9,638,400	1,290.1	9,663,300	1,289.9	9,646,700
17	1,289.8	9,638,400	1,290.1	9,663,300	1,289.9	9,646,700
18	1,290.0	9,655,000	1,290.0	9,655,000	1,289.9	9,646,700
19	1,289.9	9,646,700	1,290.0	9,655,000	1,289.9	9,646,700
20	1,289.9	9,646,700	1,289.9	9,646,700	1,289.9	9,646,700
21	1,290.0	9,655,000	1,289.9	9,646,700	1,290.0	9,655,000
22	1,290.0	9,655,000	1,290.0	9,655,000	1,289.9	9,646,700
23	1,290.0	9,655,000	1,290.0	9,655,000	1,290.0	9,655,000
24	1,290.0	9,655,000	1,289.9	9,646,700	1,289.9	9,646,700
25	1,290.1	9,663,300	1,289.9	9,646,700	1,290.0	9,655,000
26	1,290.0	9,655,000	1,289.9	9,646,700	1,289.9	9,646,700
27	1,289.8	9,638,400	1,289.9	9,646,700	1,290.0	9,655,000
28	1,290.0	9,655,000	1,289.9	9,646,700	1,289.9	9,646,700
29	1,290.0	9,655,000	1,289.9	9,646,700	1,289.8	9,638,400
30	1,290.0	9,655,000	1,289.9	9,646,700	1,289.8	9,638,400
31	1,289.9	9,646,700			1,289.9	9,646,700
Change in contents, acre-feet		+99,600		0		0

## Columbia River at Grand Coulee Dam, Wash.

Location.- Lat. 47°58'00", long. 118°58'45", opposite lot 4, sec. 36, T. 29 N., R. 30 E., in pier 3 of highway bridge at Grand Coulee, 2,500 feet downstream from Grand Coulee Dam and 14 miles upstream from Nespelem River. Datum of the gage is at mean sea level, datum of 1929.

Drainage area.- 74,100 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 637,800 second-feet 6 a.m. June 12 (gage height, 87.90 feet).

1913 to April 1948: Discharge, 492,000 second-feet June 15, 1913 (computed on basis of records of peak discharge at other gaging stations).

Discharge known, 725,000 second-feet (estimated) during flood of June 1894.

Remarks.- Flow regulated by Franklin D. Roosevelt Lake (see preceding page) and reservoirs in Kootenai, Pend Oreille, and Spokane River Basins.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	153,600	535,500	357,900	11	193,000	621,500	235,700	21	272,000	495,100	172,300
2	156,800	546,000	346,800	12	189,200	629,700	225,900	22	304,400	482,900	172,600
3	158,000	559,900	338,000	13	224,500	614,700	218,200	23	319,600	468,200	165,900
4	151,400	566,500	313,900	14	213,600	590,300	211,800	24	351,900	465,800	172,600
5	152,100	572,700	309,100	15	216,800	574,600	203,300	25	379,100	441,200	164,700
6	152,600	574,800	287,100	16	221,600	566,600	198,300	26	407,700	431,800	169,300
7	158,200	573,200	277,800	17	223,300	555,700	192,300	27	439,200	416,300	161,900
8	173,100	585,300	264,500	18	228,500	557,500	184,000	28	453,600	399,800	171,400
9	189,000	598,200	256,200	19	244,400	533,800	178,000	29	495,700	388,200	163,500
10	185,600	617,100	246,600	20	254,400	519,900	177,800	30	512,300	374,300	159,000
								31	529,000		158,000
Monthly mean discharge, in second-feet .....									267,800	528,600	221,100
Runoff, in inches .....									4.17	7.96	3.44

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	61.73	225,000	61.52	222,700	63.23	241,500	63.85	248,400	65.60	269,200	67.15	289,000
N	61.70	224,700	61.80	225,800	63.35	242,800	64.05	250,600	65.88	272,600	68.00	300,000
8	61.55	225,000	62.04	228,400	63.60	245,600	64.20	252,400	65.80	271,600	69.40	318,200
12	61.25	219,800	61.88	226,700	63.35	242,800	64.20	252,400	66.40	279,200	69.26	316,400
4	61.74	225,100	62.70	235,700	63.70	246,700	65.30	265,600	65.82	271,800	68.75	309,800
8	61.50	222,500	62.70	235,700	63.88	248,700	65.15	263,800	65.95	273,400	68.26	303,400
	May 23		May 24		May 25		May 26		May 27		May 28	
4	68.50	306,500	71.05	339,700	73.27	370,800	75.70	406,500	76.00	411,000	79.10	461,700
N	69.10	314,500	71.70	349,800	73.60	375,400	75.68	406,200	78.25	447,200	78.33	448,600
8	69.85	324,000	71.76	349,600	73.76	377,600	75.60	405,000	78.05	443,800	78.10	444,700
12	70.05	326,600	72.40	359,600	74.10	382,500	75.75	407,200	77.70	438,200	78.55	452,400
4	70.20	328,600	72.85	364,900	74.60	390,000	76.05	411,800	78.60	453,200	78.80	456,600
8	70.35	330,600	72.99	366,900	75.00	396,000	76.30	415,800	78.27	447,600	78.05	460,800
	May 29		May 30		May 31		June 1		June 2		June 3	
4	79.65	471,000	82.00	514,000	82.60	526,000	83.08	535,600	83.60	546,000	83.90	552,000
N	80.30	482,400	81.74	509,100	82.60	526,000	83.03	534,600	83.64	546,800	84.19	558,000
8	80.98	494,600	81.54	505,300	82.68	527,600	83.00	534,000	83.54	544,800	84.39	562,200
12	81.78	509,800	81.78	509,800	82.74	528,800	82.90	532,000	83.48	543,600	84.34	561,100
4	82.26	519,200	82.08	515,600	82.88	531,600	83.10	536,000	83.54	544,800	84.49	564,300
8	82.08	515,600	82.50	524,000	83.20	538,000	83.48	543,600	83.86	551,200	84.69	568,500
	June 4		June 5		June 6		June 7		June 8		June 9	
4	84.63	567,200	84.62	567,000	85.16	578,400	84.98	574,600	85.50	585,500	86.75	612,500
N	84.68	568,300	84.65	567,600	85.28	580,900	85.14	577,900	85.54	586,300	86.26	601,700
8	84.51	564,700	84.81	571,000	85.23	579,800	85.00	575,000	85.20	579,200	85.37	582,800
12	84.51	564,700	85.10	577,100	84.70	568,700	84.70	568,700	84.80	570,800	85.24	580,000
4	84.51	564,700	85.23	579,800	84.70	568,700	84.71	568,900	85.80	591,800	86.19	600,200
8	84.61	566,800	85.26	580,500	84.62	567,000	84.92	573,300	86.55	608,100	86.94	616,700
	June 10		June 11		June 12		June 13		June 14		June 15	
4	87.14	621,100	87.48	629,600	87.78	635,200	86.85	614,700	86.08	597,800	86.00	596,000
N	86.80	613,600	87.15	621,300	87.67	632,700	87.10	620,200	86.00	596,000	86.40	604,800
8	87.02	618,400	86.80	613,600	87.36	625,900	87.00	618,000	85.65	588,600	85.02	575,400
12	86.70	611,400	86.90	615,800	87.30	624,600	86.48	606,600	85.40	583,400	83.12	536,400
4	87.14	621,100	87.45	617,900	87.40	626,800	86.60	609,200	85.33	581,900	83.85	551,000
8	87.20	622,400	87.58	626,400	87.61	631,400	86.28	602,200	85.35	582,400	84.94	573,700
	June 16		June 17		June 18		June 19		June 20		June 21	
4	85.74	590,500	84.30	560,300	84.00	554,000	83.53	544,600	82.40	522,000	81.00	495,000
N	85.78	591,000	84.50	564,500	84.30	560,300	83.53	544,600	82.40	522,000	81.20	498,800
8	84.26	559,500	84.23	558,800	84.15	557,200	82.95	533,000	82.45	523,000	81.35	501,600
12	83.10	536,000	83.65	547,000	83.60	546,000	82.10	516,000	82.00	514,000	81.25	499,800
4	83.94	552,800	83.60	546,000	84.55	565,600	82.25	519,200	82.20	518,000	80.20	480,600
8	83.94	552,800	83.70	548,000	84.66	567,900	82.30	520,000	82.00	514,000	80.35	483,300

## Columbia River at Grand Coulee Dam, Wash.--Continued

Supplemental record:

May 17, 5 a.m., 61.73 ft., 225,000 sec.-ft.; 6 a.m., 61.40 ft., 221,400 sec.-ft.;  
 1 p.m., 61.61 ft., 223,700 sec.-ft.; 6 p.m., 61.75 ft., 225,200 sec.-ft.;  
 7 p.m., 61.45 ft., 222,000 sec.-ft.; 10 p.m., 61.32 ft., 220,500 sec.-ft.  
 18, 6 a.m., 61.73 ft., 225,000 sec.-ft.; 7 a.m., 61.55 ft., 223,000 sec.-ft.;  
 10 a.m., 62.08 ft., 228,900 sec.-ft.; 2 p.m., 62.10 ft., 229,100 sec.-ft.;  
 5 p.m., 62.65 ft., 235,200 sec.-ft.; 6 p.m., 62.25 ft., 230,800 sec.-ft.  
 19, 6 a.m., 63.60 ft., 245,600 sec.-ft.; 7 a.m., 63.30 ft., 242,300 sec.-ft.;  
 10 a.m., 64.00 ft., 250,000 sec.-ft.; 6 p.m., 63.80 ft., 247,800 sec.-ft.;  
 7 p.m., 63.50 ft., 244,500 sec.-ft.  
 20, 10 a.m., 64.45 ft., 255,400 sec.-ft.; 2 p.m., 64.05 ft., 250,600 sec.-ft.  
 21, 10 a.m., 66.10 ft., 275,300 sec.-ft.; 3 p.m., 65.80 ft., 271,600 sec.-ft.;  
 5 p.m., 66.65 ft., 282,400 sec.-ft.; 6 p.m., 65.85 ft., 272,200 sec.-ft.  
 22, 10 a.m., 69.20 ft., 315,600 sec.-ft.; 1 p.m., 69.55 ft., 320,200 sec.-ft.;  
 6 p.m., 69.20 ft., 315,600 sec.-ft.; 7 p.m., 68.65 ft., 308,400 sec.-ft.  
 23, 5 a.m., 68.80 ft., 310,400 sec.-ft.; 6 a.m., 68.50 ft., 306,500 sec.-ft.;  
 10 a.m., 69.75 ft., 322,800 sec.-ft.  
 24, 10 p.m., 73.05 ft., 367,700 sec.-ft.  
 25, 6 a.m., 73.02 ft., 367,300 sec.-ft.  
 26, 6 p.m., 76.05 ft., 411,800 sec.-ft.; 9 p.m., 76.40 ft., 417,400 sec.-ft.;  
 11 p.m., 75.40 ft., 417,400 sec.-ft.  
 27, 2 a.m., 75.95 ft., 410,200 sec.-ft.; 7 a.m., 78.65 ft., 454,000 sec.-ft.;  
 2 p.m., 78.10 ft., 444,700 sec.-ft.; 6 p.m., 78.60 ft., 453,200 sec.-ft.;  
 7 p.m., 78.15 ft., 445,600 sec.-ft.  
 28, 6 a.m., 79.10 ft., 461,700 sec.-ft.  
 29, 2 p.m., 81.08 ft., 496,500 sec.-ft.  
 31, 2 p.m., 82.82 ft., 530,400 sec.-ft.; 10 p.m., 83.22 ft., 538,400 sec.-ft.  
 June 2, 10 a.m., 83.82 ft., 550,400 sec.-ft.  
 3, 3 p.m., 84.64 ft., 567,400 sec.-ft.; 6 p.m., 84.29 ft., 560,100 sec.-ft.  
 4, 10 p.m., 84.71 ft., 568,900 sec.-ft.  
 6, 6 a.m., 85.14 ft., 577,900 sec.-ft.; 2 p.m., 85.23 ft., 579,800 sec.-ft.;  
 7 p.m., 84.53 ft., 565,100 sec.-ft.; 10 p.m., 84.50 ft., 564,500 sec.-ft.  
 7, 10 a.m., 85.24 ft., 580,000 sec.-ft.; 2 p.m., 85.06 ft., 576,300 sec.-ft.  
 8, 10 a.m., 85.58 ft., 587,200 sec.-ft.; 2 p.m., 85.20 ft., 579,200 sec.-ft.;  
 6 p.m., 85.66 ft., 588,900 sec.-ft.; 10 p.m., 86.42 ft., 605,200 sec.-ft.  
 9, 5 p.m., 85.22 ft., 579,600 sec.-ft.; 10 p.m., 86.76 ft., 612,700 sec.-ft.  
 10, 11 p.m., 86.97 ft., 617,300 sec.-ft.  
 11, 2 a.m., 87.70 ft., 633,400 sec.-ft.; 1 p.m., 87.10 ft., 620,200 sec.-ft.;  
 6 p.m., 86.93 ft., 616,500 sec.-ft.; 9 p.m., 87.13 ft., 620,900 sec.-ft.  
 12, 2 a.m., 87.76 ft., 634,700 sec.-ft.; 6 a.m., 87.90 ft., 637,800 sec.-ft.  
 13, 9 p.m., 86.74 ft., 612,300 sec.-ft.  
 14, 10 a.m., 86.00 ft., 596,000 sec.-ft.  
 15, 2 a.m., 85.80 ft., 591,800 sec.-ft.; 6 a.m., 86.60 ft., 609,200 sec.-ft.  
 16, 2 a.m., 85.60 ft., 587,600 sec.-ft.; 9 a.m., 85.77 ft., 591,200 sec.-ft.  
 17, 10 a.m., 84.64 ft., 567,400 sec.-ft.; 2 p.m., 84.15 ft., 557,200 sec.-ft.;  
 9 p.m., 83.85 ft., 551,000 sec.-ft.  
 18, 10 a.m., 84.37 ft., 561,800 sec.-ft.; 2 p.m., 84.10 ft., 556,100 sec.-ft.  
 19, 10 p.m., 82.40 ft., 522,000 sec.-ft.  
 20, 2 a.m., 82.45 ft., 523,000 sec.-ft.; 9 a.m., 82.53 ft., 524,600 sec.-ft.;  
 7 p.m., 82.03 ft., 514,600 sec.-ft.; 9 p.m., 82.40 ft., 522,000 sec.-ft.  
 21, 6 a.m., 80.67 ft., 489,100 sec.-ft.

## Columbia River at Trinidad, Wash.

**Location.**- Lat. 47°13'30", long. 120°00'50", in SE $\frac{1}{4}$  sec. 13, T. 20 N., R. 22 E., half a mile southwest of Trinidad,  $\frac{8}{10}$  miles downstream from Colocaham Creek, and  $\frac{1}{2}$  mile downstream from Rock Island Dam. Datum of gage is 500 feet above mean sea level, subject to correction to datum of 1929.

**Drainage area.**- 89,700 square miles.

**Gage-height record.**- Water-stage recorder graph.

**Discharge record.**- Stage-discharge relation defined by current-meter measurements.

Gage heights used to hundredths.

**Maxima.**- May-June 1948: Discharge, 692,600 second-feet 10:30 p.m. June 12 (gage height, 59.35 feet).

1913 to April 1948: Discharge, 528,000 second-feet June 15, 16, 1913 (gage height, 45.7 feet, site and datum then in use).

Discharge known, about 740,000 second-feet June 7, 1894 (based on information obtained at other points).

**Remarks.**- Flow regulated by Franklin D. Roosevelt Lake and reservoirs in Kootenai, Pend Oreille, Spokane, Okanogan, and Chelan River Basins. The many diversions above station for irrigation are probably a small percentage of flood discharge.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	154,200	609,800	409,800	11	200,400	685,700	268,000	21	277,600	571,800	195,600
2	162,700	612,000	392,000	12	205,800	689,900	257,600	22	299,800	550,300	191,500
3	163,900	614,400	376,800	13	210,700	682,700	248,500	23	336,200	535,400	189,600
4	166,800	624,600	351,000	14	233,600	663,900	236,800	24	360,200	519,800	185,200
5	164,200	627,000	337,500	15	228,400	641,100	230,500	25	395,100	502,000	189,300
6	171,400	637,000	332,800	16	232,000	625,200	223,600	26	426,400	486,600	181,300
7	172,800	639,700	312,600	17	236,700	620,100	218,800	27	461,400	476,000	182,600
8	170,200	641,900	304,500	18	238,600	613,600	213,200	28	513,600	460,700	178,500
9	188,500	658,500	281,900	19	246,600	606,200	206,800	29	557,400	445,000	184,300
10	199,900	667,600	273,600	20	263,500	585,400	205,700	30	611,000	425,400	176,100
								31	605,700		173,200
Monthly mean discharge, in second-feet.....									285,600	590,600	248,700
Runoff, in inches.....									3.67	7.35	3.20

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	39.07	235,200	39.29	238,700	39.40	240,500	40.66	260,700	41.30	271,400	42.59	293,700
8	39.06	235,100	39.23	237,800	39.54	242,700	40.74	261,900	41.38	272,800	42.73	296,200
N	39.07	235,200	39.19	237,100	39.77	246,400	40.80	262,900	41.56	275,800	42.80	297,500
4	39.26	238,300	39.21	237,500	39.90	248,500	40.90	264,600	41.85	280,800	42.95	300,200
8	39.30	238,900	39.24	237,900	40.20	253,300	41.08	267,700	42.10	285,000	43.35	307,400
12	39.31	239,100	39.30	238,900	40.45	257,300	41.18	269,400	42.36	289,600	43.96	318,500
	May 23		May 24		May 25		May 26		May 27		May 28	
4	44.59	330,500	45.56	349,000	47.31	384,400	48.71	414,400	50.30	450,100	52.20	495,300
8	44.92	336,800	45.83	354,400	47.60	390,500	48.94	419,500	50.50	454,700	52.57	504,600
N	45.02	338,700	46.09	359,600	47.84	395,500	49.20	425,200	50.67	458,600	53.00	515,300
4	45.09	340,000	46.36	365,000	48.09	400,800	49.50	431,800	50.93	464,700	53.30	522,800
8	45.09	340,000	46.73	372,400	48.30	405,400	49.84	439,500	51.33	474,300	53.67	532,300
12	45.28	343,900	47.02	378,300	48.50	409,800	50.14	446,400	51.81	485,800	53.83	536,500
	May 29		May 30		May 31		June 1		June 2		June 3	
4	54.00	540,900	56.28	602,400	56.39	605,500	56.50	608,600	56.62	612,000	56.67	613,400
8	54.28	548,200	56.61	611,700	56.30	603,000	56.45	607,200	56.57	610,600	56.67	613,400
N	54.60	556,500	56.81	617,500	56.31	603,300	56.50	608,600	56.56	610,300	56.66	613,100
4	54.86	563,500	56.90	619,900	56.40	605,800	56.60	611,400	56.64	612,500	56.70	614,200
8	55.23	573,500	56.77	616,200	56.45	607,200	56.64	612,500	56.68	613,600	56.75	615,600
12	55.73	587,000	56.56	610,300	56.48	608,000	56.64	612,500	56.68	613,600	56.89	619,600
	June 4		June 5		June 6		June 7		June 8		June 9	
4	57.00	622,800	57.11	626,000	57.31	631,800	57.69	642,800	57.59	639,900	57.98	650,600
8	57.04	624,000	57.11	626,000	57.41	634,700	57.58	639,700	57.55	638,800	58.01	652,100
N	57.03	623,700	57.11	626,000	57.50	637,300	57.51	637,700	57.55	638,800	58.19	657,500
4	57.09	625,400	57.14	626,900	57.60	640,200	57.50	637,300	57.66	641,900	58.40	663,800
8	57.19	628,300	57.20	626,600	57.64	641,400	57.55	638,900	57.80	646,000	58.54	668,000
12	57.15	627,200	57.26	630,300	57.70	643,100	57.64	641,400	57.94	650,100	58.54	668,000
	June 10		June 11		June 12		June 13		June 14		June 15	
4	58.30	660,800	58.92	679,400	59.24	689,100	59.21	688,200	58.65	671,300	57.78	645,400
8	58.29	660,500	59.04	683,000	59.12	685,400	59.13	685,700	58.51	667,100	57.61	640,500
N	58.41	664,100	59.17	687,000	59.12	685,400	59.00	681,800	58.44	665,000	57.46	636,100
4	58.61	670,100	59.22	688,500	59.27	690,100	58.91	679,100	58.30	660,800	57.56	639,000
8	58.81	678,100	59.30	691,000	59.32	691,600	58.88	678,200	58.14	656,000	57.64	641,400
12	58.96	680,600	59.26	689,800	59.30	691,000	58.80	675,800	57.97	650,900	57.51	637,600
	June 16		June 17		June 18		June 19		June 20		June 21	
4	57.17	627,700	57.04	624,000	56.86	618,700	56.60	611,400	55.95	593,200	55.40	578,100
8	56.87	619,000	56.81	617,300	56.70	614,200	56.50	608,600	55.71	586,500	55.34	576,500
N	56.77	616,200	56.75	615,800	56.58	610,800	56.37	605,000	55.56	582,400	55.24	573,800
4	57.04	624,000	56.80	617,000	56.58	610,300	56.35	604,400	55.50	580,800	55.10	570,000
8	57.24	629,800	56.90	619,900	56.58	610,800	56.29	602,700	55.50	580,800	54.85	563,200
12	57.30	631,500	56.96	621,600	56.64	612,500	56.10	597,400	55.46	579,700	54.69	558,900

Supplemental record.- June 12, 10:30 a.m., 59.35 ft., 692,600 sec.-ft.



## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

## Columbia River near The Dalles, Oreg.

Location.- Lat. 45°39', long. 120°58', in NE $\frac{1}{4}$  sec. 20, T. 2 N., R. 15 E., just upstream from Celilo Falls, 3 miles downstream from Deschutes River, and 11 miles east of The Dalles. Datum of gage is at mean sea level, datum of 1929. (See pl. 7A.)

Drainage area.- 237,000 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 1,010,000 second-feet; extended to 1,240,000 second-feet. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 1,010,000 second-feet 1:30 p.m., 3:00 p.m., and 6:30 p.m. May 31 (elevation, 154.56 feet).

1858 to April 1948: Discharge, 1,240,000 second-feet (revised) June 6, 1894 (elevation, 106.5 feet on gage at The Dalles, 160.1 feet at present site).

Remarks.- Storage and diversions for irrigation are only a small part of total runoff. Some regulation by Franklin D. Roosevelt Lake above Grand Coulee Dam and many smaller reservoirs.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	261,000	980,000	541,000	11	375,000	963,000	347,000	21	488,000	766,000	251,000
2	270,000	949,000	518,000	12	364,000	969,000	333,000	22	535,000	744,000	246,000
3	272,000	934,000	498,000	13	358,000	964,000	317,000	23	584,000	727,000	241,000
4	273,000	937,000	473,000	14	353,000	942,000	303,000	24	668,000	708,000	235,000
5	276,000	960,000	458,000	15	385,000	915,000	292,000	25	676,000	678,000	229,000
6	278,000	958,000	432,000	16	388,000	877,000	281,000	26	698,000	645,000	223,000
7	280,000	947,000	411,000	17	385,000	846,000	272,000	27	746,000	626,000	215,000
8	291,000	948,000	396,000	18	394,000	831,000	264,000	28	806,000	599,000	215,000
9	320,000	949,000	376,000	19	418,000	812,000	260,000	29	876,000	579,000	215,000
10	352,000	959,000	360,000	20	448,000	794,000	253,000	30	944,000	562,000	217,000
								31	999,000		216,000
Monthly mean discharge, in second-feet .....									476,200	835,600	318,900
Runoff, in inches .....									2.32	3.93	1.55

## Elevation, in feet, and discharge, in second-feet, at indicated time, 1948

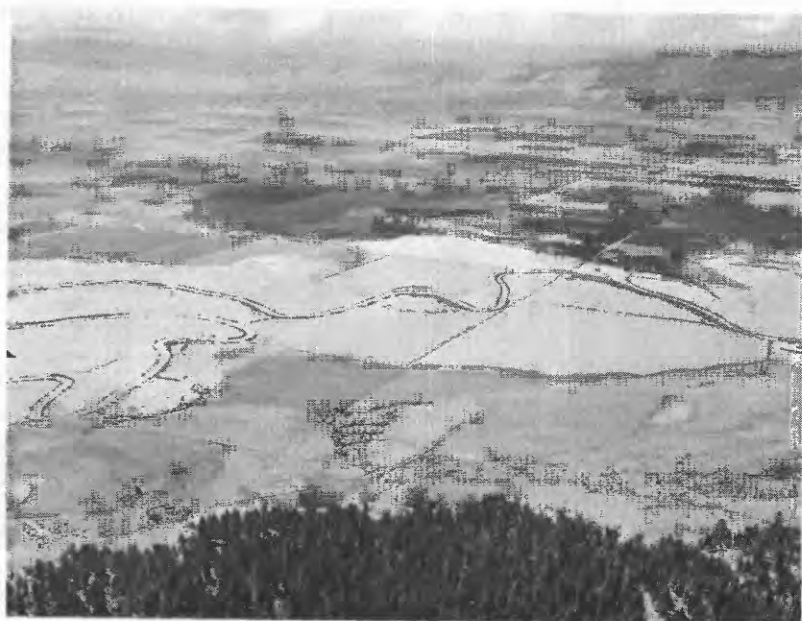
Hour	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	138.76	385,000	138.90	390,000	139.44	410,000	140.26	441,000	140.96	467,000	142.46	524,000
8	138.75	385,000	138.91	390,000	139.52	413,000	140.36	445,000	141.22	470,000	142.54	528,000
N	138.72	384,000	138.98	392,000	139.64	418,000	140.44	448,000	141.48	487,000	142.69	533,000
4	138.75	385,000	139.06	396,000	139.85	425,000	140.54	452,000	141.85	501,000	142.89	541,000
8	138.79	386,000	139.19	401,000	139.90	427,000	140.66	456,000	142.12	512,000	143.08	548,000
12	138.86	389,000	139.31	405,000	140.08	434,000	140.80	461,000	142.36	521,000	143.24	554,000
	May 23		May 24		May 25		May 26		May 27		May 28	
4	143.39	560,000	145.83	654,000	146.31	673,000	146.60	684,000	147.68	727,000	149.16	785,000
8	143.59	567,000	146.19	668,000	146.29	673,000	146.71	689,000	147.67	734,000	149.36	793,000
N	143.85	577,000	146.40	677,000	146.30	673,000	146.88	695,000	148.10	743,000	149.58	802,000
4	144.21	591,000	146.45	679,000	146.39	676,000	147.14	705,000	148.44	757,000	149.93	816,000
8	144.73	611,000	146.41	677,000	146.47	679,000	147.35	714,000	148.73	768,000	150.25	829,000
12	145.33	635,000	146.36	675,000	146.53	682,000	147.50	720,000	148.96	777,000	150.53	840,000
	May 29		May 30		May 31		June 1		June 2		June 3	
4	150.74	849,000	152.54	922,000	154.21	991,000	154.26	993,000	153.38	957,000	152.87	936,000
8	151.02	860,000	152.70	929,000	154.41	999,000	154.07	985,000	153.24	951,000	152.72	930,000
N	151.33	873,000	153.00	941,000	154.53	1003,000	153.89	977,000	153.15	947,000	152.73	930,000
4	151.75	890,000	153.32	954,000	154.53	1003,000	153.79	973,000	153.09	945,000	152.79	938,000
8	152.09	904,000	153.68	968,000	154.52	1003,000	153.68	968,000	153.02	942,000	152.84	934,000
12	152.33	914,000	153.96	980,000	154.42	999,000	153.53	964,000	152.96	939,000	152.87	936,000
	June 4		June 5		June 6		June 7		June 8		June 9	
4	152.80	933,000	153.25	951,000	153.55	964,000	153.17	948,000	153.16	948,000	153.14	947,000
8	152.78	932,000	153.39	957,000	153.47	960,000	153.11	946,000	153.11	946,000	153.10	945,000
N	152.79	932,000	153.52	962,000	153.40	957,000	153.11	946,000	153.10	945,000	153.14	947,000
4	152.89	936,000	153.61	966,000	153.35	955,000	153.15	947,000	153.12	946,000	153.22	950,000
8	153.02	942,000	153.68	968,000	153.29	953,000	153.18	948,000	153.19	952,000	153.30	953,000
12	153.13	946,000	153.60	966,000	153.22	946,000	153.18	948,000	153.17	948,000	153.31	954,000
	June 10		June 11		June 12		June 13		June 14		June 15	
4	153.38	957,000	153.52	962,000	153.69	969,000	153.63	967,000	153.29	953,000	152.56	923,000
8	153.34	955,000	153.49	957,000	153.69	969,000	153.59	965,000	153.16	948,000	148.80	919,000
N	153.40	957,000	153.45	959,000	153.70	970,000	153.58	965,000	153.02	942,000	152.35	914,000
4	153.54	963,000	153.50	962,000	153.70	970,000	153.56	964,000	153.12	947,000	152.28	914,000
8	153.59	965,000	153.66	968,000	153.67	968,000	153.49	961,000	152.78	932,000	152.20	908,000
12	153.56	964,000	153.71	970,000	153.62	966,000	153.39	957,000	152.65	927,000	151.99	900,000
	June 16		June 17		June 18		June 19		June 20		June 21	
4	151.79	891,000	150.92	856,000	150.42	843,000	150.00	819,000	149.56	801,000	148.98	778,000
8	151.56	882,000	150.75	849,000	150.35	833,000	149.95	817,000	149.48	798,000	148.80	771,000
N	151.35	873,000	150.62	844,000	150.28	829,000	149.83	812,000	149.37	794,000	148.65	765,000
4	151.22	868,000	150.55	841,000	150.19	827,000	149.76	809,000	149.26	789,000	148.51	759,000
8	151.17	868,000	150.50	839,000	150.10	823,000	149.68	806,000	149.17	786,000	148.42	756,000
12	151.07	862,000	150.48	838,000	150.02	820,000	149.59	803,000	149.11	783,000	148.36	753,000

Supplemental record.- May 31, 1:30 p.m., 3 p.m. and 6:30 p.m., 154.56 ft., 1,010,000 sec.-ft.



A. COFFERDAM AT McNARY DAM SITE OVERTOPPED BY COLUMBIA RIVER.

Courtesy of Engineering News-Record.



B. GRANDE RONDE RIVER AT LOWER END OF STATE DITCH, LOOKING SOUTHWEST.

Courtesy of Corps of Engineers, United States Army.



Kootenai River Basin

Kootenay River at Canal Flats, British Columbia

Location.- Lat. 50°08'57", long. 115°47'42", 1 mile southeast of Canal Flats and about 47 miles north of Cranbrook. Datum of gage is 2,675.09 feet above mean sea level, datum of Geodetic Survey of Canada, adjustment of 1945.

Drainage area.- 2,040 square miles.

Gage-height record.- Staff gage read once daily.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 31,300 second-feet May 24 (gage height, 8.10 feet). 1939 to April 1948: Discharge, 22,800 second-feet May 29, 1946 (gage height, 7.10 feet).

Remarks.- Records furnished by Dominion Water and Power Bureau, Department of Mines and Resources, Canada.

*Mean discharge, in second-feet, 1948*

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2,600	17,500	9,480	11	2,580	14,600	5,230	21	9,300	10,200	5,640
2	2,440	17,600	8,530	12	2,740	12,300	5,910	22	15,000	9,980	5,640
3	2,210	17,900	7,500	13	2,850	11,600	6,800	23	24,000	11,800	5,910
4	2,140	17,500	6,960	14	2,980	11,200	6,200	24	29,700	11,100	5,640
5	2,130	18,700	6,490	15	2,950	12,000	5,640	25	27,200	9,980	5,360
6	2,140	19,000	6,800	16	2,880	11,500	5,640	26	26,600	9,480	5,230
7	2,240	20,000	6,840	17	3,440	11,000	5,500	27	26,300	9,480	4,830
8	2,530	21,900	6,200	18	4,770	9,730	5,640	28	26,300	8,980	4,960
9	2,580	22,300	5,770	19	6,060	9,480	5,500	29	23,200	8,980	5,360
10	2,580	18,600	5,230	20	6,940	9,730	5,500	30	19,400	9,480	5,360
									31	17,300	4,830
Monthly mean discharge, in second-feet									9,870	13,400	6,000
Runoff, in inches									5.58	7.33	3.39

*Gage height, in feet, and discharge, in second-feet, at indicated time, 1948*

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
8a	May 17	3,440	8a	May 26	26,600	8	June 5	18,700	8a	June 13	11,600
	3.15			7.55			6.48	18,700		5.32	
8a	May 18	4,770	8a	May 27	26,300	11	6.48	18,700	8a	June 14	11,200
	3.75			7.50			6.45	18,600		5.25	
8	May 19	5,850	8a	May 28	26,300	8a	June 6	19,000	8a	June 15	12,000
	4.15			7.50			6.52	19,000		5.40	
5	May 20	6,300	8a	May 29	23,200	8a	June 7	20,000	8a	June 16	11,500
	4.30			7.10			6.65	20,000		5.30	
8a	May 21	8,860	8a	May 30	19,400	8a	June 8	21,900	8a	June 17	11,000
	5.00			6.60			6.90	21,900		5.20	
5	May 22	9,780	8a	May 31	17,300	8a	June 9	22,300	8a	June 18	9,730
	5.20			6.30			6.95	22,300		4.95	
8a	May 23	15,000	8a	June 1	17,500	8a	June 10	18,600	8a	June 19	9,480
	6.05			6.32			6.45	18,600		4.90	
8a	May 24	31,300	8a	June 2	17,600	8a	June 11	14,600	8a	June 20	9,730
	7.25			6.33			5.85	14,600		4.95	
11:15a	May 25	28,700	8a	June 3	17,900	8a	June 12	12,300	8a	June 21	10,200
	8.10			6.36			5.45	12,300		5.05	
8a	May 25	27,200	8a	June 4	17,500						
	7.62			6.30							

## Kootenay River at Wardner, British Columbia

Location.- Lat. 49°20'05", long. 115°25'42", at highway bridge a third of a mile east of Wardner station, above mouth of Elk River and below mouth of Bull River. Datum of gage is 2,523.223 feet above mean sea level, datum of Geodetic Survey of Canada, adjustment of 1928.

Drainage area.- 5,200 square miles.

Gage-height record.- Standard chain gage read once daily.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 65,000 second-feet noon May 29 (gage height, 13.17 feet).

1914 to April 1948: Discharge, 67,500 second-feet June 21, 1916 (gage height, 14.3 feet).

Remarks.- Records furnished by Dominion Water and Power Bureau, Department of Mines and Resources, Canada.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	9,120	48,400	21,800	11	8,290	55,000	11,700	21	24,700	21,100	10,900
2	8,910	47,400	20,900	12	8,350	50,600	11,700	22	34,400	21,500	11,900
3	8,350	41,000	18,300	13	8,940	39,400	12,200	23	49,200	21,400	10,700
4	7,840	49,600	16,500	14	9,860	39,200	12,800	24	53,300	21,500	10,800
5	7,420	41,900	15,000	15	9,790	34,000	11,800	25	58,400	22,100	10,800
6	7,290	52,800	14,800	16	9,450	34,400	11,600	26	62,700	20,600	10,000
7	7,290	52,800	14,800	17	10,000	34,400	11,300	27	63,300	23,000	9,210
8	7,950	53,200	14,200	18	12,700	30,200	10,900	28	63,700	21,900	9,450
9	8,210	54,600	13,400	19	16,200	27,400	10,900	29	63,700	21,800	10,600
10	8,410	54,100	12,400	20	21,000	24,100	11,000	30	60,500	21,800	10,400
								31	53,700		10,000
Monthly mean discharge, in second-feet.....									25,500	36,400	12,700
Runoff, in inches.....									5.62	7.81	2.81

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
8a	May 17 4.64	10,000	8a	May 26 12.94	62,700	8a	June 3 10.50	41,000	8a	June 12 11.65	50,600
8a	May 18 5.42	12,700	8a	May 27 13.00	63,300	8a	June 4 11.54	49,600	8a	June 13 10.30	39,400
8a	May 19 6.36	16,200	8a	May 28 13.04	63,700	8a	June 5 11.80	51,900	8a	June 14 10.26	39,200
8a	May 20 7.44	21,000	8	May 29 13.04	63,700	8a	June 6 11.90	52,800	8a	June 15 9.54	34,000
8a	May 21 8.10	24,700	10:10	13.09	64,200	8a	June 7 11.90	52,800	8a	June 16 9.60	34,400
8	May 22 9.60	34,400	11:10	13.12	64,500	8a	June 8 11.94	53,200	8a	June 17 9.60	34,400
11:34	9.80	35,800	N	13.17	65,000	8a	June 9 12.10	54,600	8a	June 18 9.00	30,200
5:05	10.17	38,500	1:20	13.05	63,800	8a	June 10 12.04	54,100	8a	June 19 8.55	27,400
8a	May 23 11.50	49,200	8a	May 30 12.72	60,500	8a	June 11 12.14	55,000	8a	June 20 8.00	24,100
8a	May 24 11.96	53,300	8a	May 31 12.00	53,700	8a	June 21 7.46	21,100			
8a	May 25 12.50	58,400	8a	June 1 11.40	48,400						
			8a	June 2 11.28	47,400						

Kootenay River at Newgate, British Columbia  
(International gaging station)

**Location.**- Lat. 49°01', long. 115°10', 100 feet above old highway bridge site and former staff gage, 0.7 mile northwest of Newgate, and 0.9 mile north of international boundary. Datum of gage is 2,310.23 feet above mean sea level, datum of Geodetic Survey of Canada, adjustment of 1945.

**Drainage area.**- 7,660 square miles.

**Gage-height record.**- Water-stage recorder graph.

**Discharge record.**- Stage-discharge relation defined by current-meter measurements below 87,000 second-feet and extended to peak stage. Gage heights used to hundredths.

**Maxima.**- May-June 1948: Discharge, 91,900 second-feet 10:30 a.m. May 28 (gage height, 15.00 feet).

1930 to April 1948: Discharge observed, 80,000 second-feet June 18, 1933 (gage height, 13.30 feet, present datum).

**Remarks.**- Records give total flow of main channel and slough. This is one of the international gaging stations maintained by Canada under agreement with the United States.

*Mean discharge, in second-feet, 1948*

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	17,600	67,600	30,100	11	14,600	65,100	16,300	21	40,800	35,700	15,200
2	17,300	65,000	29,500	12	14,300	61,400	15,700	22	51,200	35,700	15,000
3	15,700	64,000	27,300	13	15,100	52,300	15,800	23	69,100	35,900	14,600
4	14,700	64,100	24,600	14	16,900	46,400	16,500	24	80,500	36,400	14,400
5	13,800	65,400	22,700	15	17,100	44,200	16,000	25	85,400	36,300	14,400
6	13,100	65,400	21,400	16	16,700	42,600	15,400	26	88,100	35,200	13,600
7	13,000	65,000	21,000	17	17,500	41,900	15,000	27	90,700	33,500	12,500
8	13,700	65,200	20,200	18	20,900	40,900	14,600	28	91,500	32,000	12,900
9	14,500	65,900	18,900	19	27,800	37,700	14,700	29	88,600	30,900	14,700
10	15,000	66,200	17,500	20	36,100	35,800	15,100	30	85,100	30,200	16,100
								31	74,200		15,800
Monthly mean discharge, in second-feet									38,300	48,800	17,700
Runoff, in inches									5.76	7.11	2.66

*Gage height, in feet, and discharge, in second-feet, at indicated time, 1948*

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	6.67	16,900	7.10	19,200	7.94	24,800	9.07	33,700	9.67	39,100	10.51	46,700
6	6.70	17,100	7.23	20,000	8.12	26,200	9.23	35,200	9.70	39,400	10.79	49,300
N	6.77	17,400	7.39	20,900	8.33	27,800	9.38	36,500	9.74	39,800	11.00	51,300
8	6.84	17,800	7.53	21,900	8.50	29,000	9.48	37,400	9.78	40,100	11.16	52,800
8	6.92	18,200	7.69	23,000	8.70	30,600	9.58	38,300	10.30	44,800	11.67	57,700
12	7.98	25,200	7.81	23,900	8.90	32,200	9.64	38,900	10.19	43,800	12.08	61,800
	May 23		May 24		May 25		May 26		May 27		May 28	
4	12.33	64,300	13.72	78,500	14.26	84,100	14.52	86,900	14.83	90,100	14.96	91,500
8	12.58	66,800	13.88	80,100	14.33	84,900	14.56	87,300	14.88	90,600	14.99	91,800
N	12.86	69,600	13.95	80,700	14.40	85,600	14.61	87,800	14.90	90,800	14.99	91,800
4	13.05	71,500	14.03	81,700	14.46	86,200	14.68	88,500	14.93	91,200	14.96	91,500
8	13.22	73,200	14.12	82,700	14.50	86,600	14.78	89,600	14.95	91,400	14.97	91,100
12	13.45	75,600	14.18	83,300	14.51	86,800	14.83	90,100	14.95	91,400	14.87	90,500
	May 29		May 30		May 31		June 1		June 2		June 3	
4	14.81	89,800	14.45	86,700	13.63	76,600	12.96	69,200	12.65	65,500	12.57	64,200
8	14.76	89,300	14.40	85,100	13.52	75,400	12.88	68,500	12.63	65,200	12.56	64,100
N	14.72	88,800	14.23	83,300	13.42	74,300	12.83	67,700	12.63	65,200	12.62	64,600
4	14.69	88,400	14.09	81,700	13.28	72,700	12.79	67,200	12.63	65,100	12.63	64,600
8	14.68	88,200	13.95	80,200	13.16	71,400	12.73	66,500	12.61	64,800	12.60	64,200
12	14.54	86,800	13.81	78,600	13.05	70,200	12.68	65,900	12.59	64,500	12.56	64,000
	June 4		June 5		June 6		June 7		June 8		June 9	
4	12.58	63,900	12.80	65,700	12.81	65,400	12.76	64,900	12.76	64,900	12.82	65,500
8	12.59	63,900	12.81	65,700	12.81	65,400	12.76	64,900	12.78	65,100	12.84	65,700
N	12.62	64,100	12.82	65,700	12.81	65,400	12.77	65,000	12.79	65,200	12.86	65,900
4	12.66	64,400	12.82	65,700	12.81	65,400	12.78	65,100	12.81	65,400	12.88	66,100
8	12.71	65,000	12.82	65,600	12.79	65,200	12.76	64,900	12.81	65,400	12.90	66,400
12	12.75	65,300	12.81	65,400	12.77	65,000	12.76	64,900	12.81	65,400	12.92	66,600
	June 10		June 11		June 12		June 13		June 14		June 15	
4	12.90	66,400	12.86	65,900	12.61	63,300	11.85	55,500	11.00	47,300	10.68	44,200
8	12.90	66,400	12.84	65,700	12.56	62,800	11.65	53,500	11.02	47,500	10.65	44,200
N	12.88	66,100	12.78	65,100	12.49	62,000	11.50	52,000	10.91	46,500	10.64	44,100
4	12.87	66,000	12.73	64,600	12.37	60,800	11.35	50,600	10.83	45,800	10.62	43,900
8	12.86	65,900	12.70	64,200	12.23	59,300	11.21	49,300	10.76	45,100	10.59	43,600
12	12.85	65,800	12.68	64,000	12.05	57,500	11.11	48,300	10.71	44,700	10.55	43,200
	June 16		June 17		June 18		June 19		June 20		June 21	
4	10.52	43,000	10.39	41,800	10.37	41,600	10.04	38,400	9.72	36,000	9.64	35,300
8	10.52	43,000	10.38	41,700	10.33	41,300	9.97	38,100	9.70	35,800	9.65	35,400
N	10.50	42,800	10.41	42,000	10.29	40,900	9.92	37,700	9.68	35,700	9.68	35,700
4	10.47	42,500	10.42	42,100	10.24	40,500	9.86	37,200	9.67	35,600	9.70	35,800
8	10.44	42,300	10.41	42,000	10.17	39,800	9.80	36,700	9.66	35,500	9.71	35,900
12	10.40	41,900	10.40	41,900	10.11	39,300	9.75	36,300	9.65	35,400	9.70	35,800

## Kootenai River at Libby, Mont.

Location.- Lat. 48°24', long. 115°33', in NW $\frac{1}{4}$  sec. 3, T. 30 N., R. 31 W., 1,200 feet downstream from highway bridge at Libby and half a mile downstream from Libby Creek.

Drainage area.- 10,240 square miles.

Gage-height record.- Water-stage recorder graph until 12 p.m. June 8; thereafter, graph based on inside gage equivalents of once-daily wire-weight gage readings. No gage-height record July 18-25.

Discharge record.- Stage-discharge relation defined by current-meter measurements below, 87,000 second-feet and extended to peak stage. Discharge for period of no gage-height record computed on basis of records for Flathead River at Columbia Falls.

Maxima.- May-June 1948: Discharge, 122,000 second-feet 10 a.m. May 28 (gage height, 19.93 feet).

1910 to April 1948: Discharge, 130,000 second-feet June 21, 1916 (gage height, 20.7 feet, present datum).

Remarks.- No regulation or diversion.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	26,500	89,500	31,100	11	23,400	83,700	18,500	21	59,800	39,900	16,000
2	25,800	84,300	30,400	12	22,600	77,800	17,500	22	68,000	40,200	16,500
3	23,700	82,800	28,800	13	23,300	67,300	17,400	23	85,300	40,000	16,500
4	22,200	82,900	26,800	14	25,300	56,200	17,700	24	99,100	40,600	16,000
5	21,300	84,700	23,600	15	25,500	51,300	17,600	25	108,000	40,800	15,500
6	20,500	84,600	21,800	16	24,700	49,700	16,900	26	113,000	39,100	15,300
7	21,300	83,700	21,800	17	25,800	49,900	16,600	27	118,000	36,500	14,500
8	23,100	83,200	21,600	18	29,600	47,900	16,000	28	121,000	34,000	13,800
9	25,200	84,000	20,200	19	37,200	43,800	15,500	29	120,000	32,600	15,300
10	24,800	85,200	19,200	20	49,700	40,700	15,000	30	114,000	31,700	17,000
								31	101,000		17,400
Monthly mean discharge, in second-feet .....									52,540	59,620	18,950
Runoff, in inches .....									5.91	6.49	2.13

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height		Discharge		Gage height		Discharge		Gage height		Discharge		Gage height		Discharge		
	May 17		May 18		May 19		May 20		May 21		May 22		May 23		May 24		
4	7.72	25,100	8.32	27,900	9.57	34,200	11.31	44,500	13.36	59,700	13.81	63,500					
N	7.80	25,400	8.48	28,700	9.81	35,500	11.64	46,700	13.38	59,800	14.00	64,900					
8	7.87	25,800	8.63	29,400	10.02	36,700	11.93	48,700	13.34	59,500	14.22	66,800					
4	7.93	26,000	8.79	30,200	10.38	38,700	12.28	51,200	13.35	59,600	14.59	69,900					
8	8.02	26,400	9.01	31,300	10.71	40,700	12.95	56,400	13.39	59,900	15.06	73,900					
12	8.15	27,100	9.26	32,600	11.03	42,600	13.25	58,800	13.59	61,500	15.33	76,400					
May 23		May 24		May 25		May 26		May 27		May 28							
4	15.66	79,300	17.31	95,300	18.41	106,000	19.00	112,000	19.43	116,000	19.86	121,000					
N	15.99	82,300	17.49	97,100	18.50	107,000	19.08	113,000	19.53	118,000	19.91	122,000					
8	16.36	85,800	17.69	99,100	18.58	108,000	19.15	114,000	19.61	118,000	19.92	122,000					
4	16.62	88,400	17.87	101,000	18.63	108,000	19.16	114,000	19.64	119,000	19.89	121,000					
8	16.89	91,100	18.08	103,000	18.72	109,000	19.19	114,000	19.68	119,000	19.85	121,000					
12	17.11	93,300	18.25	105,000	18.85	111,000	19.29	115,000	19.76	120,000	19.83	121,000					
May 29		May 30		May 31		June 1		June 2		June 3							
4	19.82	121,000	19.46	117,000	18.41	106,000	17.06	92,800	16.34	85,600	16.11	83,400					
N	19.79	120,000	19.34	116,000	18.16	104,000	16.86	90,800	16.26	84,800	16.07	82,900					
8	19.74	120,000	19.18	114,000	17.91	101,000	16.68	89,000	16.17	83,900	16.04	82,600					
4	19.68	119,000	19.01	112,000	17.66	98,800	16.53	87,500	16.13	83,500	16.01	82,300					
8	19.63	118,000	18.81	110,000	17.44	96,600	16.43	86,500	16.11	83,400	16.03	82,500					
12	19.54	118,000	18.60	108,000	17.25	94,700	16.40	86,200	16.11	83,400	16.07	82,900					
June 4		June 5		June 6		June 7		June 8		June 9							
4	16.07	82,900	16.22	84,400	16.26	84,800	16.21	84,300	16.10	83,200	16.15	83,700					
N	16.05	82,700	16.25	84,700	16.24	84,600	16.16	83,800	16.07	82,900	16.16	83,800					
8	16.04	82,600	16.26	84,800	16.23	84,500	16.12	83,400	16.11	83,300	16.18	84,000					
4	16.05	82,700	16.27	84,900	16.21	84,300	16.11	83,300	16.10	83,200	16.20	84,200					
8	16.10	83,200	16.26	84,800	16.22	84,400	16.13	83,500	16.10	83,200	16.22	84,400					
12	16.16	83,800	16.28	85,000	16.22	84,400	16.14	83,600	16.12	83,400	16.25	84,700					
June 10		June 11		June 12		June 13		June 14		June 15							
4	16.28	85,000	16.27	84,900	15.80	80,200	14.94	71,600	13.62	59,300	12.77	52,200					
N	16.32	85,400	16.25	84,700	15.69	79,100	14.73	69,500	13.39	57,200	12.70	51,600					
8	16.32	85,400	16.18	84,000	15.57	77,900	14.52	67,400	13.19	55,500	12.64	51,100					
4	16.30	85,200	16.10	83,200	15.44	76,600	14.27	65,100	13.07	54,600	12.61	50,900					
8	16.29	85,100	16.00	82,200	15.31	75,300	14.03	63,000	12.95	53,600	12.55	50,400					
12	16.28	85,000	15.91	81,300	15.15	73,700	13.83	61,200	12.86	52,900	12.50	50,000					
June 16		June 17		June 18		June 19		June 20		June 21							
4	12.45	49,600	12.60	50,800	12.34	48,800	11.85	45,400	11.24	41,300	11.01	39,800					
N	12.40	49,200	12.51	50,100	12.30	48,500	11.72	44,400	11.19	40,900	11.00	39,700					
8	12.42	49,400	12.48	49,800	12.23	48,000	11.60	43,600	11.15	40,700	11.02	39,800					
4	12.46	49,700	12.44	49,500	12.15	47,400	11.49	42,900	11.11	40,400	11.04	40,000					
8	12.52	50,200	12.41	49,300	12.07	46,900	11.39	42,200	11.07	40,200	11.05	40,000					
12	12.59	50,700	12.37	49,000	11.97	46,200	11.32	41,800	11.04	40,000	11.07	40,200					

Supplemental record.- May 28, 10 a.m., 19.93 ft., 122,000 sec.-ft.; June 17, 2 a.m., 12.61 ft., 50,900 sec.-ft.

## Kootenai River at Leonia, Idaho

**Location.**- Lat. 48°37', long. 116°03', in SW $\frac{1}{4}$  sec. 17, T. 33 N., R. 34 W., at Leonia, 450 feet east of Montana-Idaho State line and half a mile upstream from Boulder Creek. Datum of gage is 1,700.00 feet above mean sea level (U. S. Coast and Geodetic Survey datum).

**Drainage area.**- 11,740 square miles.

**Gage-height record.**- Water-stage recorder graph.

**Discharge record.**- Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 24-28.

**Maxima.**- May-June 1948: Discharge, 123,000 second-feet 1:30 a.m. May 28 (elevation, 1,823.40 feet).

1928 to April 1948: Discharge, 95,500 second-feet June 18, 1933 (elevation, 1,818.11 feet).

Elevation known, 1,824.6 feet June 1894 (discharge not determined).

**Remarks.**- No diversion or regulation above station.

## Elevation,\* in feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	33,400	93,600	36,800	11	30,300	84,600	21,700	21	75,300	47,800	18,900
2	32,000	88,600	36,200	12	29,300	83,400	20,800	22	82,200	47,600	18,600
3	29,400	86,800	33,900	13	30,900	75,200	20,500	23	96,700	47,000	18,200
4	28,000	86,800	30,700	14	33,200	65,200	20,800	24	107,000	48,100	17,800
5	26,900	87,300	28,600	15	33,000	60,300	20,900	25	113,000	48,700	17,500
6	25,900	86,800	27,000	16	32,000	59,100	19,900	26	117,000	46,800	17,300
7	27,400	85,800	26,200	17	33,800	59,900	19,200	27	120,000	43,600	16,500
8	30,000	85,100	25,800	18	38,400	58,300	18,800	28	122,000	41,100	16,300
9	32,800	84,800	24,500	19	48,500	53,900	18,400	29	119,000	39,100	17,600
10	32,100	85,900	23,100	20	62,600	49,300	18,800	30	113,000	37,800	19,000
								31	103,000		19,800
Monthly mean discharge, in second-feet									59,290	65,610	22,260
Runoff, in inches									5.82	6.24	2.19

## Elevation,\* in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	9.51	32,800	10.31	36,400	11.79	44,300			16.39	74,400	17.07	79,100
8	9.62	33,300	10.50	37,300	12.10	46,100	14.34	60,500	16.59	75,700	17.27	80,500
N	9.75	33,900	10.70	38,300	12.39	47,900			16.60	75,800	17.39	81,300
4	9.85	34,300	10.86	39,100	12.75	50,200	14.87	64,000	16.57	75,600	17.64	83,100
8	9.96	34,800	11.11	40,600	13.24	53,400			16.68	76,400	18.03	85,800
12	10.15	35,600	11.45	42,400	13.68	56,300	15.77	70,100	16.84	77,500	18.51	89,200
	May 23		May 24		May 25		May 26		May 27		May 28	
4	18.90	91,900			21.81	112,000	22.44	116,000	22.86	119,000	23.39	123,000
8	19.26	94,400	20.94	105,000	21.99	113,000	22.48	117,000	22.90	119,000	23.34	123,000
N	19.66	97,200			21.88	112,000	22.48	117,000	22.93	119,000	23.29	122,000
4	20.00	99,600	21.31	108,000	21.96	113,000	22.52	117,000	23.08	120,000	23.19	122,000
8	20.24	101,000			22.17	114,000	22.67	118,000	23.28	122,000	23.16	121,000
12	20.45	103,000	21.69	111,000	22.54	116,000	22.79	119,000	23.38	123,000	23.09	121,000
	May 29		May 30		May 31		June 1		June 2		June 3	
4	22.99	121,000	22.34	116,000	21.01	107,000	19.53	96,300	18.63	90,000	18.25	87,400
8	22.86	120,000	22.13	115,000	20.72	105,000	19.30	94,700	18.50	89,100	18.19	86,900
N	22.75	119,000	22.92	113,000	20.40	102,000	19.07	93,100	18.37	88,200	18.12	86,400
4	22.66	118,000	21.68	112,000	20.12	100,000	18.89	91,800	18.27	87,500	18.10	86,300
8	22.61	118,000	21.51	110,000	19.94	99,200	18.80	91,200	18.31	87,800	18.14	86,600
12	22.52	117,000	21.28	109,000	19.75	97,800	18.72	90,600	18.29	87,600	18.19	86,900
	June 4		June 5		June 6		June 7		June 8		June 9	
4	18.20	87,000	18.23	87,200	18.25	87,400	18.12	86,400	17.99	85,500	17.92	85,000
8	18.19	86,900	18.23	87,200	18.18	86,900	18.06	86,000	17.94	85,200	17.89	84,800
N	18.12	86,000	18.23	87,200	18.13	86,500	17.98	85,500	17.87	84,700	17.85	84,600
4	18.13	86,500	18.23	87,200	18.11	86,400	17.94	85,200	17.85	84,600	17.85	84,600
8	18.16	86,700	18.28	87,600	18.16	86,700	18.01	85,700	17.91	85,000	17.84	84,500
12	18.22	87,100	18.29	87,600	18.17	86,800	18.02	85,700	17.91	85,000	17.93	85,100
	June 10		June 11		June 12		June 13		June 14		June 15	
4	18.08	86,200	17.86	84,600	17.88	84,800	17.13	79,500	15.42	67,700	14.46	61,300
8	18.11	86,400	17.86	84,600	17.80	84,200	16.86	77,600	15.24	66,500	14.37	60,700
N	18.10	86,300	17.84	84,500	17.72	83,600	16.54	75,400	15.02	65,000	14.28	60,200
4	18.04	85,900	17.83	84,400	17.59	82,700	16.16	72,800	14.81	63,700	14.20	59,600
8	17.97	85,400	17.85	84,600	17.50	82,100	15.86	70,700	14.70	62,900	14.17	59,400
12	17.88	84,800	17.88	84,800	17.35	81,000	15.61	69,100	14.60	62,200	14.12	59,100
	June 16		June 17		June 18		June 19		June 20		June 21	
4	14.09	58,900	14.35	60,600	14.14	59,200	13.60	55,700	12.79	50,400	12.40	48,200
8	14.09	58,900	14.33	60,500	14.11	59,100	13.45	54,800	12.69	49,800	12.37	47,800
N	14.07	58,800	14.24	59,900	14.02	58,400	13.31	53,900	12.58	49,000	12.32	47,500
4	14.11	59,100	14.20	59,600	13.93	57,900	13.16	52,900	12.48	48,500	12.32	47,500
8	14.16	59,400	14.18	59,500	13.82	57,100	13.03	52,000	12.43	48,200	12.36	47,800
12	14.23	59,800	14.15	59,300	13.71	56,500	12.90	51,200	12.43	48,200	12.42	48,100

**Supplemental record.**- May 28, 1:30 a.m., 23.40 ft., 123,000 sec.-ft.

\* Add 1,800.00 feet to obtain elevation above mean sea level.



## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

Kootenai River at Boom Camp, near Bonners Ferry, Idaho

Location.- Lat. 48°42'05", long. 116°14'30", in NW¼ sec. 29, T. 62 N., R. 2 E., 600 feet east of Boom Camp, 3½ miles upstream from Bonners Ferry, and 4 miles downstream from Moyie River. Datum of gage is 1,700.00 feet above mean sea level (U. S. Coast and Geodetic Survey datum).

Gage-height record.- Water-stage recorder graph.

Maxima.- May-June 1948: Elevation, 1,779.87 feet 8 p.m. May 28.

1927 to April 1948: Elevation recorded, 1,776.58 feet June 18, 1933.

Remarks.- Elevations affected by backwater from Kootenay Lake May 19 to July 10.

Mean elevation\*, in feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	64.93	77.90	66.59	11	64.54	76.03	62.77	21	73.44	69.88	62.10
2	64.77	77.15	66.32	12	64.54	75.94	62.56	22	75.24	69.58	62.04
3	64.26	76.75	65.88	13	64.74	75.28	62.45	23	76.98	69.27	61.92
4	63.99	76.60	65.24	14	65.18	73.97	62.48	24	78.24	69.21	61.73
5	63.75	76.54	64.66	15	65.13	72.96	62.54	25	78.80	69.20	61.73
6	63.56	76.45	64.19	16	64.96	72.36	62.35	26	78.46	68.92	61.7
7	63.85	76.30	63.91	17	65.31	72.17	62.19	27	79.31	68.39	61.51
8	64.34	76.14	63.74	18	66.05	71.81	62.07	28	79.59	67.85	61.47
9	64.90	76.05	63.43	19	67.60	71.21	61.99	29	79.66	67.35	61.73
10	64.86	76.12	63.10	20	70.31	70.44	62.09	30	79.54	66.94	62.11
								31	78.77		62.29

\* Add 1,700 feet to obtain elevation above mean sea level.

Elevation\*, in feet, at indicated time, 1948

Hour	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	65.13		65.74		66.88		69.25		72.64		74.41	
8	65.23		65.88		67.19		69.74		73.32		74.85	
N	65.33		66.04		67.54		70.23		73.59		75.14	
4	65.41		66.16		67.94		70.74		73.76		75.42	
8	65.49		66.29		68.27		71.46		73.92		75.77	
12	65.61		66.57		68.74		72.18		74.15		76.34	
	May 23		May 24		May 25		May 26		May 27		May 28	
4	76.70		77.62		78.34		78.39		79.54		79.22	
8	76.78		77.84		78.72		78.30		79.62		79.50	
N	77.00		78.50		79.04		78.30		79.74		79.72	
4	77.17		78.62		79.28		78.45		79.42		79.81	
8	77.19		78.59		78.89		78.70		78.82		79.87	
12	77.65		78.50		78.55		79.02		78.85		79.79	
	May 29		May 30		May 31		June 1		June 2		June 3	
4	79.69											
8	79.69		79.46		78.92		78.06		77.25		76.79	
N	79.70											
4	79.64		79.28		78.66		77.72		77.04		76.68	
8	79.59											
12	79.54		79.10		78.36		77.46		76.89		76.64	
	June 4		June 5		June 6		June 7		June 8		June 9	
4												
8	76.62		76.55		76.50		76.35		76.19		76.07	
N												
4	76.56		76.51		76.40		76.25		76.10		76.00	
8												
12	76.55		76.53		76.39		76.22		76.09		76.04	
	June 10		June 11		June 12		June 13		June 14		June 15	
4												
8	76.14		76.03		76.01		75.51		74.17		73.09	
N												
4	76.16		76.00		75.91		75.10		73.77		72.80	
8												
12	76.10		76.01		75.76		74.58		73.39		72.57	
	June 16		June 17		June 18		June 19		June 20		June 21	
4												
8	72.39		72.26		71.88		71.34		70.54		69.94	
N												
4	72.28		72.13		71.74		71.11		70.30		69.84	
8												
12	72.25		72.00		71.56		70.81		70.12		69.71	

Supplemental record.- May 24, 1:30 a.m., 77.82 ft., 6:15 a.m., 77.52 ft.

\* Add 1,700 feet to obtain elevation above mean sea level.

## Kootenai River at Bonners Ferry, Idaho

Location.- Lat. 48°42'00", long. 116°18'45", in NE¼ sec. 27, T. 62 N., R. 1 E., on highway bridge at Bonners Ferry. Datum of gage is 1,743.00 feet above mean sea level (U. S. Coast & Geodetic Survey datum). (See pl. 8, 9A.)

Drainage area.- 13,000 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-fall-discharge relation defined by current-meter measurements below 120,000 second-feet and extended to peak discharge. Backwater effect from Kootenay Lake usually present at Bonners Ferry. Discharge for periods of backwater at Boom Camp from Kootenay Lake, May 19 to July 10, computed on basis of fall between gages at Boom Camp and near Bonners Ferry; discharge for remainder of period computed on basis of stage-discharge relation for station at Boom Camp. Discharge measurements made at station near Bonners Ferry.

Maxima.- May-June 1948: Discharge, 139,000 second-feet 6 p.m. May 27, affected by dike breakages downstream; elevation, 1,778.32 feet 7 p.m. May 28.

1927 to April 1948: Discharge, 99,800 second-feet June 18, 1933; elevation, 1,774.98 feet June 19, 1933.

Flood in June 1894 reached an elevation of 1,777.2 feet.

Remarks.- No diversion or regulation above station.

Mean elevation\*, in feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	57.58	76.40	63.74	11	57.99	73.97	57.01	21	70.53	67.93	53.34
2	57.82	77.47	63.29	12	57.62	73.89	56.32	22	72.57	67.54	53.17
3	57.10	74.92	62.73	13	58.20	73.34	55.65	23	74.26	67.12	52.88
4	56.53	74.69	61.99	14	59.15	72.21	55.28	24	75.99	66.91	52.64
5	56.13	74.57	61.14	15	59.29	71.19	55.10	25	76.51	66.78	52.44
6	55.66	74.47	60.33	16	59.05	70.55	54.65	26	75.77	66.53	52.31
7	56.04	74.30	59.73	17	59.58	70.21	54.14	27	77.29	66.04	51.95
8	57.02	74.14	59.17	18	60.77	69.89	53.74	28	77.88	65.41	51.78
9	56.25	73.99	58.53	19	63.00	69.32	53.44	29	78.10	64.81	52.08
10	56.44	74.03	57.77	20	66.70	68.54	53.42	30	77.63	64.24	52.51
								31	77.34	-	52.85

\*Add 1,700 feet to obtain elevation above sea level.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	36,600	104,000	38,600	11	34,200	89,500	22,800	21	81,300	50,500	19,600
2	35,600	97,400	37,900	12	33,000	88,600	21,800	22	87,800	50,000	19,300
3	32,500	94,500	35,800	13	35,400	80,700	21,200	23	103,000	48,900	18,800
4	30,900	93,900	32,700	14	38,200	69,000	21,400	24	111,000	49,700	18,200
5	29,500	93,900	30,100	15	37,800	63,200	21,700	25	121,000	50,300	17,900
6	28,400	93,500	28,200	16	36,800	61,200	20,800	26	123,000	48,700	17,800
7	30,100	91,900	27,100	17	39,000	61,800	20,000	27	128,000	45,600	17,000
8	33,000	90,200	26,400	18	43,600	59,400	19,500	28	130,000	43,200	16,800
9	36,400	89,500	25,000	19	49,400	56,200	19,100	29	130,000	41,200	18,100
10	36,200	90,800	23,400	20	65,300	52,100	19,500	30	123,000	39,900	19,600
								31	112,000	-	20,500
Monthly mean discharge, in second-feet.....									64,260	69,640	23,120
Runoff, in inches.....									5.70	5.98	2.05

## Kootenai River at Bonners Ferry, Idaho--Continued

Elevation\*, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	59.21	37,800	60.28	41,700	62.14	45,000	65.32	59,600	69.65	79,400	71.81	84,400
8	59.38	38,500	60.50	42,600	62.57	46,900	65.97	62,200	70.24	81,500	72.22	87,500
N	59.57	39,100	60.70	43,700	62.93	49,000	66.44	64,700	70.51	82,300	72.52	88,300
4	59.72	39,600	60.98	44,500	63.37	51,800	67.13	67,400	70.83	82,500	72.95	88,600
8	59.88	40,100	61.25	45,300	63.95	53,800	67.96	71,900	71.10	82,500	73.42	89,700
12	60.07	40,900	61.66	47,200	64.64	56,600	68.83	75,600	71.44	83,300	73.97	93,600
	May 23		May 24		May 25		May 26		May 27		May 28	
4	74.13	98,700	75.14	107,000	76.04	116,000	75.43	127,000	77.62	120,000	77.31	128,000
8	74.10	101,000	75.55	108,000	76.41	117,000	75.31	126,000	78.09	124,000	77.70	129,000
N	74.28	103,000	76.15	115,000	76.87	118,000	75.41	123,000	78.00	130,000	78.12	130,000
4	74.24	108,000	76.50	113,000	77.42	124,000	75.85	121,000	77.11	136,000	78.26	131,000
8	74.19	106,000	76.73	111,000	76.24	132,000	76.49	120,000	76.05	137,000	78.31	132,000
12	75.08	105,000	76.56	113,000	75.74	128,000	77.09	119,000	76.77	127,000	78.19	133,000
	May 29		May 30		May 31		June 1		June 2		June 3	
4	78.05	131,000										
8	78.14	130,000	77.96	125,000	77.48	114,000	76.57	105,000	75.56	98,200	74.98	94,800
N	78.16	130,000										
4	78.10	129,000	77.76	122,000	77.26	110,000	76.23	102,000	75.35	96,300	74.83	93,900
8	78.04	128,000										
12	78.01	127,000	77.62	118,000	76.92	108,000	75.84	99,900	75.14	95,200	74.74	94,200
	June 4		June 5		June 6		June 7		June 8		June 9	
4												
8	74.72	94,200	74.59	94,100	74.49	94,200	74.34	92,500	74.16	90,900	74.01	89,900
N												
4	74.65	93,600	74.56	93,700	74.43	92,700	74.25	91,200	74.12	89,300	73.96	88,900
8												
12	74.61	93,900	74.52	94,300	74.38	92,900	74.21	91,000	74.05	89,900	73.97	89,600
	June 10		June 11		June 12		June 13		June 14		June 15	
4												
8	74.02	91,200	73.98	89,300	73.93	89,600	73.51	83,400	72.41	70,300	71.34	64,000
N												
4	74.07	91,300	73.93	89,200	73.87	88,200	73.23	78,800	72.03	67,400	71.02	62,300
8												
12	74.03	90,400	73.93	89,500	73.72	86,400	72.80	73,300	71.66	65,100	70.75	61,600
	June 16		June 17		June 18		June 19		June 20		June 21	
4												
8	70.62	61,000	70.28	62,400	69.95	60,100	69.46	56,900	68.65	52,500	68.02	50,200
N												
4	70.46	61,000	70.18	61,600	69.85	59,000	69.21	56,000	68.43	51,400	67.83	50,600
8												
12	70.34	61,600	70.05	60,800	69.66	57,800	68.93	53,900	68.21	51,100	67.68	50,100

Supplemental record.-- May 23, 2 a.m., 74.21 ft., 2 p.m., 74.33 ft., 6 p.m., 74.12 ft.; May 24, 1 a.m., 75.32 ft., 6 a.m., 75.96 ft.

\* Add 1,700 feet to obtain elevation above mean sea level.



**A. BREAK IN DIKE ALONG KOOTENAI RIVER IN IDAHO THROUGH WHICH RECLAMATION DISTRICT NO. 5 WAS FLOODED.**

Courtesy of R. B. McComb, United States Weather Bureau.



**B. BREAK IN DIKE ALONG KOOTENAI RIVER NEAR BONNERS FERRY.**

Courtesy of United States Forest Service.





**A. BONNERS FERRY, IDAHO, FLOODED BY KOOTENAI RIVER.**

Courtesy of R. B. McComb, United States Weather Bureau.



**B. BRIDGE OF THE UNITED STATES FOREST SERVICE OVER LONG CANYON CREEK NEAR PORTHILL, IDAHO.**



## Kootenai River near Bonners Ferry, Idaho

Location.- Lat. 48°41'55", long. 116°20'40", in NW¼ sec. 28, T. 62 N., R. 1 E., 1.6 miles downstream from highway bridge at Bonners Ferry. Datum of gage is 1,700.00 feet above mean sea level (U. S. Coast and Geodetic Survey datum).

Drainage area.- 13,000 square miles.

Gage-height record.- Water-stage recorder graph.

Maxima.- May-June 1948: Elevation, 1,776.84 feet 6:30 p.m. May 28.

1928 to April 1948: Elevation, 1,774.17 feet June 20, 1933.

Remarks.- Elevations affected by backwater from Kootenay Lake.

## Mean elevation\*, in feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	56.83	75.35	65.40	11	57.42	73.17	56.76	21	69.58	67.48	53.04
2	57.21	74.54	62.92	12	57.05	73.08	56.08	22	71.78	67.04	52.87
3	56.52	74.06	62.42	13	57.61	72.60	55.40	23	73.24	66.67	52.61
4	55.95	73.83	61.69	14	58.55	71.62	55.02	24	75.03	66.46	52.35
5	55.57	73.81	60.90	15	58.72	70.68	54.84	25	75.25	66.34	52.17
6	55.13	73.61	60.14	16	58.47	70.02	54.38	26	74.44	66.10	52.02
7	55.47	73.47	59.54	17	58.94	69.69	53.87	27	75.81	65.65	51.68
8	56.37	73.30	58.94	18	60.12	69.38	53.47	28	76.46	65.07	51.44
9	57.59	73.19	58.27	19	62.24	68.80	53.16	29	76.65	64.48	51.70
10	57.85	73.23	57.63	20	65.65	68.11	53.12	30	76.53	63.89	52.14
								31	76.26		52.40

\* Add 1,700 feet to obtain elevation above mean sea level.

## Elevation\*, in feet, at indicated time, 1948

Hour	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	58.60		59.63		61.58		64.32		68.73		70.94	
8	58.76		59.86		61.80		65.01		69.37		71.33	
N	58.93		60.14		62.24		65.67		69.76		71.72	
4	59.10		60.34		62.62		66.30		70.04		72.13	
8	59.26		60.55		63.07		67.02		70.32		72.57	
12	59.43		60.90		63.68		67.90		70.62		73.08	
	May 23		May 24		May 25		May 26		May 27		May 28	
4	73.18		74.23		74.83		73.83		76.44		75.98	
8	73.12		74.62		75.52		73.77		76.70		76.43	
N	73.28		75.23		76.06		74.12		76.45		76.70	
4	73.01		75.63		76.08		74.63		75.28		76.82	
8	73.22		75.73		74.48		75.25		74.33		76.83	
12	74.07		75.44		74.16		75.97		75.35		76.69	
	May 29		May 30		May 31		June 1		June 2		June 3	
4	76.61		76.58		76.36		75.52		74.64		74.12	
8	76.71											
N	76.72											
4	76.66		76.49		76.16		75.18		74.43		73.99	
8	76.60											
12	76.58		76.44		75.84		74.87		74.25		73.90	
	June 4		June 5		June 6		June 7		June 8		June 9	
4	73.86		73.74		73.64		73.50		73.34		73.21	
8												
N	73.80		73.70		73.58		73.43		73.28		73.17	
4												
8	73.76		73.68		73.55		73.40		73.24		73.18	
12												
	June 10		June 11		June 12		June 13		June 14		June 15	
4	73.22		73.18		73.13		72.78		71.79		70.79	
8												
N	73.26		73.14		73.07		72.50		71.45		70.53	
4												
8	73.22		73.14		72.96		72.15		71.12		70.27	
12												
	June 16		June 17		June 18		June 19		June 20		June 21	
4	70.08		69.75		69.43		68.95		68.23		67.58	
8												
N	69.92		69.64		69.33		68.71		67.99		67.38	
4												
8	69.81		69.53		69.19		68.48		67.76		67.23	

Supplemental record.- May 23, 2 a.m., 73.33 ft.; May 25, 2 p.m., 76.24 ft.; May 27, 7 p.m., 74.17 ft.; May 28, 6:30 p.m., 76.84.

\* Add 1,700 feet to obtain elevation above mean sea level.



## Kootenai River at Klockmann Ranch, near Bonners Ferry, Idaho

Location.- Lat. 48°47'40", long. 116°22'50", in SE $\frac{1}{4}$  sec. 19, T. 63 N., R. 1 E., at Klockmann Ranch, 800 feet south of viaduct on Kootenai Valley branch of Great Northern Railway and 8 miles north of Bonners Ferry. Datum of gage is 1,700.00 feet above mean sea level (U. S. Coast and Geodetic Survey datum).

Gage-height record.- Water-stage recorder graph except period 2 p.m. July 9 to 9 a.m. July 12, for which mean elevations were computed on basis of records for other stations on Kootenai River.

Maxima.- May-June 1948: Elevation, 1,773.82 feet 8 p.m. May 28.

1928 to April 1948: Elevation, 1,771.24 feet June 20, 1933.

Remarks.- Elevations affected by backwater from Kootenay Lake.

Mean elevation\*, in feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	54.75	72.74	62.02	11	55.46	70.92	55.50	21	66.41	66.11	51.80
2	55.15	72.12	61.52	12	55.12	70.88	54.88	22	68.46	65.57	51.63
3	54.56	71.71	61.05	13	55.56	70.58	54.25	23	69.96	65.18	51.39
4	54.03	71.50	60.44	14	56.49	68.85	53.84	24	71.42	64.90	51.14
5	53.67	71.37	59.66	15	56.69	69.08	53.62	25	71.43	64.74	50.95
6	53.24	71.27	58.94	16	56.48	68.48	53.16	26	70.86	64.50	50.79
7	53.52	71.18	58.34	17	56.86	68.14	52.68	27	72.46	64.11	50.50
8	54.35	71.05	57.75	18	57.95	67.81	52.28	28	73.22	63.57	50.29
9	55.52	70.93	57.00	19	59.85	67.38	51.97	29	73.50	63.05	50.42
10	55.79	70.92	56.40	20	62.97	66.79	51.89	30	73.58	62.53	50.74
								31	73.48		51.00

\* Add 1,700 feet to obtain elevation above mean sea level.

Elevation\*, in feet, at indicated time, 1948

Hour	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	56.55		57.50		59.05		61.77		65.48		67.69	
8	56.70		57.70		59.42		62.39		66.15		68.02	
N	56.85		57.95		59.77		62.95		66.60		68.40	
4	57.00		58.16		60.28		63.53		66.92		68.80	
8	57.17		58.38		60.72		64.15		67.15		69.24	
12	57.30		58.70		61.21		64.81		67.42		69.67	
	May 23		May 24		May 25		May 26		May 27		May 28	
4	69.93		71.03		70.50		70.51		72.43		72.62	
8	69.91		71.17		71.57		70.41		72.84		73.02	
N	70.08		71.55		72.08		70.56		73.14		73.41	
4	69.86		71.89		72.28		70.90		72.73		73.71	
8	69.85		71.90		71.18		71.38		71.67		73.82	
12	70.52		71.13		70.83		71.94		72.18		73.68	
	May 29		May 30		May 31		June 1		June 2		June 3	
4	73.56		73.61									
8	73.61		73.60		73.64		72.87		72.20		71.75	
N	73.50		73.52									
4	73.56		73.53		73.40		72.60		72.04		71.67	
8	73.37		73.60									
12	73.52		73.66		73.14		72.38		71.88		71.58	
	June 4		June 5		June 6		June 7		June 8		June 9	
4												
8	71.53		71.38		71.30		71.20		71.09		70.94	
N												
4	71.48		71.34		71.25		71.16		71.04		70.90	
8												
12	71.42		71.32		71.22		71.12		70.99		70.90	
	June 10		June 11		June 12		June 13		June 14		June 15	
4												
8	70.92		70.92		70.90		70.69		70.00		69.20	
N												
4	70.95		70.92		70.85		70.52		69.72		68.95	
8												
12	70.94		70.92		70.79		70.26		69.45		68.71	
	June 16		June 17		June 18		June 19		June 20		June 21	
4												
8	68.54		68.19		67.87		67.46		66.90		66.23	
N												
4	68.40		68.09		67.75		67.29		66.69		66.00	
8												
12	68.27		67.96		67.62		67.12		66.44		65.77	

Supplemental record.- May 24, 5 a.m., 70.88 ft., 6 p.m., 71.02 ft.; May 25, 3 a.m., 70.32 ft., 3 p.m., 72.32 ft.; May 27, 1 p.m., 73.16 ft.

\* Add 1,700 feet to obtain elevation above mean sea level.

Kootenai River near Copeland, Idaho  
(International gaging station)

Location.- Lat. 48°54'45", long. 116°25'00", in NW¼NW¼SW¼ sec. 12, T. 64 N., R. 1 W., at Andrews Ranch, three-quarters of a mile downstream from Mission Creek and 1½ miles northwest of Copeland. Datum of gage is 1,700.00 feet above mean sea level (U. S. Coast and Geodetic Survey datum).

Drainage area.- 13,400 square miles.

Gage-height record.- Water-stage recorder graph except July 16, 17, when elevation was determined on basis of records for other stations on Kootenai River.

Discharge record.- Discharge for flood period not available for this report.

Maxima.- May-June 1948: Elevation, 1,770.10 feet 5 a.m. May 31.

1929 to April 1948: Daily discharge, 90,500 second-feet June 19, 1933; elevation, 1,767.98 feet June 20, 1935.

Remarks.- Stage-discharge relation affected by backwater from Kootenay Lake. This station is one of the international gaging stations maintained by the United States under agreement with Canada.

Gage height, in feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	51.76	68.93	59.60	11	52.78	67.64	53.98	21	62.17	63.58	50.27
2	52.26	68.59	59.18	12	52.53	67.60	53.38	22	64.04	63.10	50.10
3	51.88	68.25	58.75	13	52.90	67.40	52.81	23	65.64	62.71	49.87
4	51.45	68.03	58.20	14	53.68	66.97	52.37	24	66.78	62.39	49.68
5	51.16	67.92	57.59	15	53.90	66.38	52.09	25	67.27	62.15	49.62
6	50.83	67.86	56.97	16	53.79	65.84	51.65	26	67.05	61.87	49.34
7	51.01	67.80	56.42	17	54.14	65.43	51.20	27	69.03	61.53	49.10
8	51.70	67.72	55.84	18	55.03	65.08	50.81	28	69.61	61.08	48.90
9	52.65	67.63	55.27	19	56.51	64.67	50.54	29	68.89	60.52	48.94
10	53.00	67.62	54.66	20	59.02	64.15	50.40	30	69.53	60.06	49.12
								31	69.77		49.26

Gage height, in feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	53.97		54.84		56.15		58.55		61.83		63.71	
8												
N	54.25		55.22		56.78		59.53		62.69		64.31	
4												
8	54.52		55.60		57.56		60.64		63.22		65.04	
12												
	May 23		May 24		May 25		May 26		May 27		May 28	
4	65.48		66.53		66.64		66.60		68.33			
8	65.59		66.67		67.15		66.77		68.99		69.46	
N	65.71		66.92		67.64		66.88		69.53			
4	65.75		66.98		67.95		67.17		69.71		69.85	
8	65.66		66.67		67.21		67.58		68.97			
12	65.97		67.24		66.67		66.07		68.87		70.00	
	May 29		May 30		May 31		June 1		June 2		June 3	
4	68.77		69.54		69.99							
8			69.24									
N			69.15		68.87		68.60		68.24			
4	68.21		69.57		69.60							
8			69.95									
12	69.41		70.06		69.26		68.73		68.37		68.11	
	June 4		June 5		June 6		June 7		June 8		June 9	
4												
8	68.04		67.92		67.87		67.80		67.72		67.63	
N												
4												
8	67.99		67.90		67.83		67.77		67.68		67.62	
12												
	June 10		June 11		June 12		June 13		June 14		June 15	
4												
8	67.62		67.63		67.60		67.42		66.96		66.35	
N												
4												
8	67.63		67.65		67.55		67.23		66.65		66.08	
12												
	June 16		June 17		June 18		June 19		June 20		June 21	
4												
8	65.84		65.42		65.08		64.68		64.15		63.59	
N												
4												
8	65.63		65.24		64.88		64.42		63.85		63.32	
12												

Supplemental record.- May 24, 2 p.m., 67.10 ft., 7 p.m., 66.62 ft., 11 p.m., 67.28 ft.; May 25, 10 p.m., 66.80 ft.; May 26, 3 a.m., 66.57 ft.; May 27, 3 a.m., 68.39 ft., 3 p.m., 69.74 ft., 10 p.m., 68.77 ft.; May 28, 1 p.m., 69.87 ft., May 29, 1 a.m., 70.07 ft., 2 p.m., 68.06 ft.; May 30, 11 a.m., 69.11 ft.; May 31, 5 a.m., 70.10 ft.

Kootenai River at Porthill, Idaho  
(International gaging station)

Location.- Lat. 49°00'00", long. 116°30'10", in SW $\frac{1}{4}$  sec. 8, T. 65 N., R. 1 W., 300 feet south of international boundary at Porthill. Datum of gage is 1,700.00 feet above mean sea level (U. S. Coast and Geodetic Survey datum) and 1,699.80 feet above mean sea level (datum of Geodetic Survey of Canada, adjustment of 1928).

Drainage area.- 13,700 square miles.

Gage-height record.- Water-stage recorder graph except for period 5 p.m. June 9 to 2:15 p.m. June 17, for which daily mean elevations were computed on basis of recorded range in stage and records for other stations on Kootenai River.

Discharge record.- Discharge for flood period not available for this report.

Maxima.- May-June 1948: Elevation, 1,766.16 feet 1:30 a.m. May 31.

1928 to April 1948: Daily discharge, 93,200 second-feet June 19, 1933; elevation, 1,764.08 feet May 31, 1938.

Maximum elevation known, 1,772.7 feet sometime in June 1894.

Remarks.- Elevations affected by backwater from Kootenay Lake. Boundary dike of Reclamation Farm and Forest Service roadway dike (south side of Boundary Creek) were breached in many places and there was flow entire width of valley. This station is one of the international gaging stations maintained by the United States under agreement with Canada.

Elevation\*, in feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	49.34	65.21	57.86	11	50.52	65.25	52.81	21	58.20	61.84	49.20
2	49.77	65.42	57.46	12	50.39	65.25	52.25	22	59.68	61.37	49.03
3	49.54	65.33	57.02	13	50.73	65.15	51.74	23	61.00	60.91	48.82
4	49.26	65.29	56.54	14	51.33	64.70	51.33	24	61.98	60.56	48.68
5	49.08	65.26	56.01	15	51.51	64.25	50.99	25	62.68	60.25	48.52
6	48.85	65.25	55.49	16	51.47	63.85	50.63	26	62.74	59.91	48.35
7	48.96	65.26	54.96	17	51.81	63.58	50.21	27	64.23	59.57	48.11
8	49.44	65.22	54.45	18	52.52	63.21	49.81	28	64.72	59.16	47.96
9	50.31	65.19	53.91	19	53.72	62.81	49.54	29	64.32	58.74	47.91
10	50.62	65.20	53.36	20	55.82	62.37	49.35	30	65.07	58.30	47.98
								31	65.55	48.06	

Elevation\*, in feet, at indicated time, 1948

Hour	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge
	May 17		May 18		May 19		May 20		May 21	
4	51.59		52.24		53.20		55.02		57.54	
8	51.71		52.32		53.46		55.40		57.89	
N	51.80		52.45		53.70		55.77		58.25	
4	51.92		52.70		53.98		56.22		58.57	
8	52.03		52.84		54.29		56.67		58.85	
12	52.15		53.00		54.65		57.14		59.05	
	May 23		May 24		May 25		May 26		May 27	
4	60.74		61.63		62.41		62.50		63.72	
8	60.89		61.85		62.33		62.57		64.04	
N	61.06		62.04		62.68		62.62		64.38	
4	61.21		62.22		62.98		62.74		64.65	
8	61.20		62.24		63.01		63.00		64.63	
12	61.27		62.45		62.60		63.37		64.40	
	May 29		May 30		May 31		June 1		June 2	
4	65.07		64.88		65.90		65.17			
8	64.37		64.85		65.65		65.13		65.46	
N	63.62		64.75		65.47		65.12			
4	63.67		64.99		65.34		65.19		65.41	
8	64.15		65.55		65.27		65.30			
12	64.66		66.02		65.21		65.40		65.38	
	June 4		June 5		June 6		June 7		June 8	
4										
8	65.30		65.27		65.25		65.27		65.24	
N										
4	65.28		65.25		65.24		65.25		65.20	
8										
12	65.27		65.25		65.26		65.25		65.20	
	June 10		June 11		June 12		June 13		June 14	
4										
8										
N										
4										
8										
12										
	June 16		June 17		June 18		June 19		June 20	
4										
8					63.27		62.89		62.47	
N										
4					63.15		62.76		62.27	
8										
12					63.03		62.61		62.11	

Supplemental record.- May 25, 2 a.m., 62.55 ft., 6 a.m., 62.30 ft., 6 p.m., 63.10 ft.; May 27, 6 p.m., 64.73 ft.; May 29, 2:30 a.m., 65.16 ft., 2 p.m., 63.57 ft.; May 31, 1:30 a.m., 66.16 ft.

\* Add 1,700.00 feet to obtain elevation above mean sea level.

Kootenay Lake at Kuskonook, British Columbia  
(International gaging station)

Location.- Lat. 49°17'57", long. 116°40'24", at Kuskonook Hotel on east shore of lake. Datum of gage is 1,735.00 feet above mean sea level, datum of Geodetic Survey of Canada, adjustment of 1928. Elevations given herein are to U. S. Coast and Geodetic Survey datum, which is 0.20 foot lower than Canadian datum as determined at Port-hill, Idaho.

Gage-height record.- Water-stage recorder graph, except May 10, 11, when elevations were computed on basis of unpublished records for gage at Queens Bay.

Maxima.- May-June 1948: Elevation, 1,761.25 feet June 11.

1936 to April 1948: Elevation, 1,758.79 feet June 7, 1938.

Remarks.- This station is one of the international gaging stations maintained by Canada under agreement with the United States.

Mean elevation,\* in feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	44.16	58.54	54.63	11	45.47	61.22	50.30	21	48.51	58.00	47.26
2	44.40	59.03	53.67	12	45.60	61.22	49.91	22	49.57	57.58	47.11
3	44.59	59.57	53.25	13	45.76	61.10	49.58	23	50.68	57.12	47.00
4	44.75	60.01	52.85	14	45.96	60.90	49.18	24	51.90	56.72	46.91
5	44.85	60.38	52.51	15	46.16	60.57	48.83	25	53.03	56.31	46.77
6	44.88	60.66	52.20	16	46.33	60.19	48.49	26	54.05	55.90	46.60
7	44.93	60.88	51.83	17	46.56	59.81	48.18	27	55.06	55.49	46.42
8	45.01	60.97	51.47	18	46.86	59.34	47.87	28	56.15	55.09	46.25
9	45.13	61.02	51.08	19	47.15	58.86	47.62	29	56.92	54.72	46.11
10	45.29	61.18	50.68	20	47.65	58.42	47.40	30	57.50	54.38	45.97
								31	58.06		45.80

Elevation,\* in feet, at indicated time, 1948

Hour	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge	Elevation	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	46.49		46.75		47.03		47.46		48.20		49.23	
8	46.52		46.80		47.10		47.55		48.36		49.42	
N	46.53		46.83		47.15		47.66		48.51		49.58	
4	46.59		46.88		47.20		47.71		48.66		49.73	
8	46.63		46.94		47.28		47.90		48.87		49.92	
12	46.68		46.98		47.37		48.05		49.08		50.09	
	May 23		May 24		May 25		May 26		May 27		May 28	
4	50.29		51.48		52.70		53.76		54.70		55.84	
8	50.51		51.68		52.88		53.93		54.88		56.00	
N	50.70		51.90		53.03		54.07		55.06		56.15	
4	50.88		52.10		53.20		54.22		55.21		56.30	
8	51.08		52.29		53.38		54.37		55.41		56.46	
12	51.28		52.50		53.57		54.54		55.62		56.62	
	May 29		May 30		May 31		June 1		June 2		June 3	
4	56.75		57.34		57.88		58.40		58.85		59.41	
8	56.87		57.43		57.95		58.48		58.94		59.50	
N	56.99		57.49		58.10		58.54		59.04		59.56	
4	57.08		57.57		58.15		58.60		59.12		59.63	
8	57.17		57.65		58.24		58.70		59.22		59.71	
12	57.27		57.77		58.30		58.80		59.32		59.79	
	June 4		June 5		June 6		June 7		June 8		June 9	
4	59.88		60.28		60.60		60.82		60.97		61.01	
8	59.96		60.34		60.64		60.85		60.97		61.00	
N	60.03		60.36		60.65		60.88		60.97		61.00	
4	60.09		60.40		60.69		60.90		60.96		60.96	
8	60.15		60.47		60.73		60.93		60.97		61.00	
12	60.22		60.56		60.78		60.97		61.01		61.04	
	June 10		June 11		June 12		June 13		June 14		June 15	
4	61.09		61.25		61.24		61.17		60.98		60.70	
8	61.11		61.22		61.23		61.14		60.93		60.66	
N	61.19		61.22		61.22		61.10		60.87		60.58	
4	61.20		61.21		61.20		61.06		60.83		60.50	
8	61.22		61.22		61.19		61.04		60.78		60.46	
12	61.24		61.24		61.18		61.01		60.74		60.36	
	June 16		June 17		June 18		June 19		June 20		June 21	
4	60.32		59.96		59.52		59.04		58.58		58.13	
8	60.24		59.88		59.45		58.95		58.50		58.08	
N	60.21		59.79		59.34		58.86		58.42		58.03	
4	60.14		59.72		59.24		58.77		58.36		57.95	
8	60.08		59.65		59.18		58.68		58.29		57.87	
12	60.02		59.59		59.10		58.64		58.19		57.82	

\* Add 1,700 feet to obtain elevation above mean level.

## Fortine Creek near Trego, Mont.

Location.- Lat. 48°39', long. 114°55', in NE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 11, T. 33 N., R. 26 W., a quarter of a mile upstream from Edna Creek, 1 mile downstream from Stewart Creek, and  $5\frac{1}{2}$  miles southwest of Trego.

Drainage area.- 111 square miles.

Gage-height record.- Wire-weight gage read once daily except for period May 21-24.

Discharge.- Stage-discharge relation defined by current-meter measurements below 720 second-feet and extended to peak stage. Discharge for period of no gage-height record computed on basis of floodmark and observer's notes. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 1,000 second-feet May 22 (gage height, 10.46 feet, from floodmark).

1946 to April 1948: Discharge, 962 second-feet Apr. 29, 1947 (gage height, 10.28 feet, from floodmark).

Remarks.- No diversion or regulation above station.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	706	292	53	11	569	143	47	21	800	116	83
2	584	257	67	12	514	169	49	22	1,000	109	51
3	499	224	65	13	551	149	47	23	900	106	47
4	499	240	59	14	624	143	43	24	800	105	42
5	505	223	59	15	521	134	46	25	778	116	40
6	479	184	57	16	485	119	45	26	682	105	34
7	611	165	53	17	540	137	42	27	600	116	35
8	667	143	59	18	674	150	40	28	514	99	35
9	882	127	52	19	744	133	51	29	424	88	105
10	708	134	49	20	773	113	103	30	398	80	78
								31	330		65
Monthly mean discharge, in second-feet.....									624	147	54.9
Runoff, in inches.....									6.48	1.47	0.57

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
8a	May 17 7.24	540	10a	May 29 6.14	424	N	June 6 3.48	184	7a	June 14 2.92	143
8a	May 18 8.42	674	10a	May 30 5.88	398	7a	June 7 3.22	165	8a	June 15 2.80	134
9a	May 19 9.00	744	10a	May 31 5.20	330	8a	June 8 2.92	143	7a	June 16 2.58	119
7a	May 20 9.22	773	10a	June 1 4.78	292	7a	June 9 2.70	127	7a	June 17 2.84	137
10a	May 25 9.26	778	7a	June 2 4.38	257	7a	June 10 2.80	134	7a	June 18 3.02	150
9a	May 26 8.48	682	7a	June 3 3.98	224	7a	June 11 2.92	143	7a	June 19 2.78	133
8a	May 27 7.78	600	7a	June 4 4.18	240	9a	June 12 3.28	169	8a	June 20 2.50	113
9a	May 28 7.00	514	7a	June 5 3.96	223	10a	June 13 3.00	149	7a	June 21 2.54	116

## Lake Creek at Troy, Mont.

Location.— Lat. 48°26'40", long. 115°52'30", in SW $\frac{1}{4}$  sec. 18, T. 31 N., R. 33 W., a quarter of a mile downstream from power plant, half a mile upstream from mouth, and 1 $\frac{1}{2}$  miles southeast of Troy.

Drainage area.— 211 square miles.

Gage-height record.— Water-stage recorder graph.

Discharge record.— Stage-discharge relation defined by current-meter measurements. Gage heights used to hundredths.

Maxima.— May-June 1948: Discharge, 3,250 second-feet 2 a.m. May 30 (gage height, 8.28 feet).

1945 to April 1948: Discharge, 2,400 second-feet May 9, 1947 (gage height, 6.48 feet).

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	708	2,860	1,180	11	766	2,530	772	21	1,740	1,700	592
2	682	2,900	1,140	12	766	2,380	743	22	2,030	1,630	592
3	657	2,910	1,100	13	826	2,200	705	23	2,060	1,550	565
4	675	2,910	1,040	14	847	2,090	676	24	2,170	1,520	538
5	651	2,800	995	15	812	2,020	648	25	2,120	1,490	493
6	657	2,710	945	16	819	2,070	620	26	2,220	1,450	484
7	714	2,720	925	17	898	2,180	592	27	2,440	1,400	475
8	798	2,670	886	18	947	1,980	556	28	3,000	1,340	538
9	805	2,640	838	19	1,040	1,870	574	29	3,180	1,290	520
10	786	2,700	790	20	1,380	1,790	601	30	3,060	1,240	475
								31	2,880		430
Monthly mean discharge, in second-feet									1,391	2,118	711
Runoff, in inches									7.59	11.20	3.88

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	5.40	875	5.50	945	5.57	994	5.87	1,210	6.60	1,780	6.68	1,840
8	5.46	917	5.48	931	5.60	1,020	5.98	1,300	6.56	1,750	6.85	1,990
N	5.43	896	5.50	945	5.63	1,040	6.13	1,410	6.58	1,760	7.02	2,130
4	5.44	903	5.49	938	5.64	1,040	6.13	1,410	6.52	1,720	7.02	2,130
8	5.44	903	5.51	952	5.70	1,080	6.30	1,540	6.48	1,680	7.00	2,120
12	5.47	924	5.54	973	5.76	1,130	6.50	1,700	6.64	1,810	6.93	2,060
	May 23		May 24		May 25		May 26		May 27		May 28	
4	6.77	1,920	6.98	2,100	7.04	2,150	7.10	2,200	7.25	2,330	7.98	2,970
8	6.92	2,050	7.05	2,160	6.92	2,050	7.19	2,280	7.41	2,460	8.00	2,990
N	6.95	2,070	7.07	2,170	7.00	2,120	7.19	2,280	7.37	2,430	8.08	3,060
4	7.02	2,130	7.13	2,230	6.97	2,090	7.10	2,200	7.38	2,440	8.00	2,990
8	7.05	2,160	7.15	2,240	7.00	2,120	7.04	2,150	7.56	2,590	8.03	3,020
12	6.92	2,050	7.10	2,200	7.07	2,170	7.13	2,230	7.61	2,640	8.15	3,130
	May 29		May 30		May 31		June 1		June 2		June 3	
4	8.21	3,180	8.26	3,220	8.05	2,950	7.99	2,880	8.03	2,930	8.03	2,930
8	8.22	3,190	8.16	3,090	8.04	2,940	8.01	2,900	8.08	2,990	8.03	2,930
N	8.20	3,180	8.15	3,080	8.00	2,890	8.01	2,900	8.04	2,940	8.02	2,910
4	8.22	3,190	8.08	2,990	7.96	2,840	7.97	2,850	7.98	2,870	8.05	2,950
8	8.22	3,190	8.03	2,930	7.91	2,780	7.93	2,810	7.95	2,830	7.98	2,870
12	8.25	3,220	8.03	2,930	7.95	2,830	7.97	2,850	7.97	2,850	8.04	2,940
	June 4		June 5		June 6		June 7		June 8		June 9	
4	8.10	3,010	7.97	2,850	7.89	2,760	7.92	2,790	7.90	2,770	7.87	2,730
8	8.07	2,970	7.99	2,880	7.90	2,770	7.93	2,810	7.88	2,750	7.84	2,700
N	8.01	2,900	7.95	2,830	7.86	2,720	7.87	2,730	7.81	2,660	7.78	2,630
4	7.97	2,850	7.91	2,780	7.80	2,650	7.79	2,640	7.75	2,590	7.74	2,580
8	7.94	2,820	7.85	2,710	7.79	2,640	7.78	2,630	7.72	2,550	7.70	2,530
12	7.95	2,830	7.86	2,720	7.76	2,720	7.85	2,710	7.82	2,670	7.77	2,610
	June 10		June 11		June 12		June 13		June 14		June 15	
4	7.91	2,780	7.72	2,550	7.66	2,480	7.48	2,270	7.35	2,120	7.30	2,060
8	7.95	2,830	7.73	2,570	7.62	2,430	7.46	2,240	7.34	2,110	7.29	2,050
N	7.90	2,770	7.72	2,550	7.56	2,360	7.42	2,200	7.34	2,110	7.27	2,030
4	7.84	2,700	7.68	2,510	7.53	2,330	7.38	2,150	7.32	2,080	7.23	1,980
8	7.74	2,580	7.66	2,480	7.50	2,290	7.35	2,120	7.30	2,060	7.23	1,980
12	7.69	2,520	7.66	2,480	7.48	2,270	7.34	2,110	7.29	2,050	7.25	2,000
	June 16		June 17		June 18		June 19		June 20		June 21	
4	7.27	2,030	7.52	2,210	7.28	2,040	7.17	1,910	7.08	1,810	7.02	1,750
8	7.27	2,030	7.47	2,360	7.27	2,030	7.15	1,890	7.08	1,810	7.02	1,750
N	7.28	2,040	7.40	2,180	7.22	1,970	7.13	1,870	7.07	1,800	6.97	1,690
4	7.32	2,080	7.34	2,110	7.20	1,940	7.11	1,850	7.04	1,770	6.95	1,670
8	7.36	2,130	7.32	2,090	7.17	1,910	7.09	1,820	7.03	1,760	6.94	1,660
12	7.43	2,210	7.28	2,040	7.16	1,900	7.08	1,810	7.02	1,750	6.92	1,640

Supplemental record.— May 22, 3 a.m., 6.62 ft., 1,800 sec.-ft., 9 a.m., 7.03 ft., 2,140 sec.-ft.; May 23, 2 a.m., 6.90 ft., 2,030 sec.-ft., 10 a.m., 6.90 ft., 2,030 sec.-ft.; May 24, 2 a.m., 6.88 ft., 2,010 sec.-ft.; May 26, 6 a.m., 7.19 ft., 2,280 sec.-ft., 6 p.m., 2,680 sec.-ft.; May 28, 2 a.m., 7.85 ft., 2,860 sec.-ft., 6 a.m., 8.05 ft., 3,040 sec.-ft.; May 30, 2 a.m., 8.28 ft., 3,230 sec.-ft., 10 a.m., 8.12 ft., 3,040 sec.-ft.; June 3, 11 a.m., 7.97 ft., 2,830 sec.-ft.

## Boulder Creek near Leonia, Idaho

Location.- Lat. 48°36', long. 116°08', in NW $\frac{1}{4}$  sec. 32, T. 61 N., R. 3 E., three-quarters of a mile downstream from McGinty Creek, three-quarters of a mile upstream from buildings of Idamont Lead-Zinc Mines Co.,  $2\frac{1}{2}$  miles upstream from mouth, and  $2\frac{1}{2}$  miles southwest of Leonia.

Drainage area.- 53 square miles.

Gage-height record.- Water-stage recorder graph except period 4 a.m. May 29 to 11:30 a.m. June 4, when there was no gage-height record.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 660 second-feet and extended to peak stage of flood of Oct. 19, 1947, on basis of contracted-opening computation. Discharge for period of no gage-height record computed on basis of records for Moyie River at Eileen. Shifting-control method used June 25 to July 31.

Maxima.- May-June 1948: Discharge, 1,710 second-feet 9 p.m. May 27 (gage height, 6.42 feet).

1928 to April 1948: Discharge, 2,700 second-feet Oct. 19, 1947 (gage height, 7.85 feet), by contracted-opening determination.

Remarks.- No diversion or regulation above station.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	332	720	92	11	460	390	52	21	983	193	50
2	305	690	83	12	535	341	51	22	1,030	178	44
3	305	660	74	13	718	291	48	23	1,070	166	39
4	328	656	71	14	584	358	46	24	1,290	172	37
5	298	586	70	15	535	288	42	25	1,150	169	34
6	361	563	67	16	590	304	40	26	1,110	151	32
7	426	525	70	17	699	291	38	27	1,270	137	32
8	535	498	67	18	721	259	37	28	1,190	125	64
9	525	451	59	19	878	229	50	29	1,000	115	56
10	460	426	56	20	1,070	207	66	30	880	104	45
								31	770		41
Monthly mean discharge, in second-feet.....									723	341	53.3
Runoff, in inches.....									15.72	7.19	1.16

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	4.77	694	4.78	689	4.90	760	5.27	982	5.12	892	5.32	1,010
8	4.73	662	4.71	650	4.87	742	5.30	1,000	5.06	856	5.21	946
N	4.76	678	4.69	640	5.00	820	5.32	1,010	5.10	880	5.32	1,010
4	4.82	712	4.87	742	5.27	982	5.53	1,140	5.45	1,090	5.37	1,040
8	4.86	736	5.03	858	5.39	1,050	5.71	1,250	5.46	1,100	5.37	1,040
12	4.83	718	4.99	814	5.36	1,040	5.36	1,040	5.58	1,170	5.49	1,110
	May 23		May 24		May 25		May 26		May 27		May 28	
4	5.76	1,280	5.61	1,190	5.39	1,050	5.31	1,010	5.33	1,020	5.77	1,290
8	5.49	1,110	5.81	1,320	5.34	1,020	5.21	946	5.25	970	5.56	1,160
N	5.33	1,020	5.77	1,290	5.27	982	5.25	970	5.53	1,140	5.46	1,100
4	5.26	976	5.96	1,410	5.87	1,360	5.77	1,290	6.08	1,490	5.52	1,130
8	5.28	988	5.96	1,410	5.79	1,300	5.69	1,240	6.37	1,680	5.47	1,100
12	5.27	982	5.67	1,230	5.53	1,140	5.52	1,130	6.17	1,550	5.36	1,040
	May 29		May 30		May 31		June 1		June 2		June 3	
4	5.29	994										
8												
N												
4												
8												
12												
	June 4		June 5		June 6		June 7		June 8		June 9	
4			4.57	574	4.53	552	4.47	520	4.38	475	4.35	460
8			4.52	546	4.47	520	4.40	485	4.32	445	4.28	426
N	4.64	612	4.50	535	4.45	510	4.37	470	4.31	440	4.24	408
4	4.70	645	4.60	590	4.57	574	4.53	552	4.51	540	4.28	426
8	4.78	689	4.72	656	4.69	640	4.57	574	4.56	568	4.39	480
12	4.68	634	4.61	596	4.56	568	4.48	525	4.46	515	4.43	500
	June 10		June 11		June 12		June 13		June 14		June 15	
4	4.36	465	4.23	404	4.14	365	3.98	302	4.23	404	3.97	298
8	4.34	455	4.25	412	4.09	344	3.94	287	4.21	394	3.94	287
N	4.26	417	4.17	377	4.05	328	3.92	279	4.11	352	3.91	276
4	4.20	390	4.15	369	4.04	325	3.91	276	4.07	336	3.92	279
8	4.20	390	4.20	390	4.04	325	3.94	287	4.06	332	3.94	287
12	4.18	382	4.22	399	4.02	317	4.02	317	4.02	317	3.94	287
	June 16		June 17		June 18		June 19		June 20		June 21	
4	3.94	287	4.00	309								
8	4.00	309	3.96	294	3.87	262	3.79	234	3.72	211	3.67	194
N	4.01	313	3.93	283								
4	3.99	305	3.92	279	3.84	251	3.75	220	3.69	201	3.67	194
8	4.00	309	3.94	287								
12	4.01	313	3.92	279	3.83	248	3.75	220	3.68	198	3.64	185

Supplemental record.- May 19, 6 p.m., 5.28 ft., 988 sec.-ft.; May 20, 2 p.m., 5.33 ft., 1,020 sec.-ft., 6 p.m., 5.71 ft., 1,250 sec.-ft.; May 21, 11 p.m., 5.47 ft., 1,100 sec.-ft.; May 25, 11 a.m., 5.18 ft., 928 sec.-ft., 6 p.m., 5.92 ft., 1,390 sec.-ft.; May 26, 10 a.m., 5.18 ft., 928 sec.-ft., 6 p.m., 5.86 ft., 1,350 sec.-ft.; May 27, 9 a.m., 5.22 ft., 952 sec.-ft., 6 p.m., 6.05 ft., 1,470 sec.-ft., 9 p.m., 6.42 ft., 1,710 sec.-ft.; May 28, 2 p.m., 5.61 ft., 1,190 sec.-ft.; June 14, 6 a.m., 4.28 ft., 426 sec.-ft.

Moyle River at Eastport, Idaho  
(International gaging station)

Location.- Lat. 49°00', long. 116°11', in SE $\frac{1}{4}$  sec. 10, T. 65 N., R. 2 E., at Eastport, 1,000 feet downstream from international boundary.

Drainage area.- 570 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 7,130 second-feet and extended to peak stage.

Maxima.- May-June 1948: Discharge, 8,030 second-feet 11 p.m. May 24 (gage height, 10.25 feet).

1929 to April 1948: Discharge, 6,800 second-feet May 10, 1947; gage height, 9.46 feet Apr. 28, 1934.

Remarks.- No regulation or diversion above station. This station is one of the international gaging stations maintained by the United States under agreement with Canada.

Mean discharge, in second-feet, 1948

mean discharge, in second-feet, 1940											
Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2,590	4,630	1,180	11	2,510	3,390	582	21	5,960	2,010	432
2	2,310	4,340	1,070	12	2,610	3,400	615	22	6,590	1,850	406
3	2,160	4,260	983	13	3,460	3,080	563	23	7,280	1,820	379
4	2,210	4,300	895	14	3,240	3,020	513	24	7,680	1,900	369
5	2,070	4,100	828	15	2,960	2,840	489	25	7,750	1,830	350
6	2,140	3,920	774	16	3,140	2,740	466	26	7,790	1,700	330
7	2,380	3,750	743	17	3,620	2,820	458	27	7,770	1,650	330
8	2,550	3,550	721	18	3,780	2,690	411	28	7,410	1,540	443
9	2,650	3,390	663	19	4,290	2,460	427	29	6,600	1,400	460
10	2,560	3,540	615	20	5,140	2,220	483	30	5,670	1,300	416
								31	5,000		379
Monthly mean discharge, in second-feet.....									4,318	2,848	573
Runoff, in inches.....									8.73	5.57	1.16

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	7.51	3,640	7.61	3,780	7.88	4,170	8.28	4,770	9.14	6,120	9.32	6,410
8	7.50	3,630	7.58	3,740	7.88	4,170	8.27	4,760	9.02	5,930	9.35	6,460
N	7.47	3,590	7.54	3,690	7.90	4,200	8.32	4,830	8.91	5,760	9.37	6,500
4	7.47	3,590	7.54	3,690	7.97	4,300	8.57	5,210	8.91	5,760	9.45	6,640
8	7.52	3,660	7.66	3,850	8.09	4,480	8.96	5,840	9.06	6,000	9.61	6,910
12	7.59	3,760	7.83	4,100	8.23	4,700	9.16	6,160	9.23	6,270	9.67	7,010
	May 23		May 24		May 25		May 26		May 27		May 28	
4	9.80	7,230	9.82	7,260	10.16	7,870	10.23	7,990	10.17	7,890	10.16	7,870
8	9.90	7,400	9.97	7,530	10.08	7,720	10.16	7,870	10.13	7,810	10.03	7,630
N	9.91	7,420	10.14	7,850	10.00	7,580	10.06	7,690	10.02	7,620	9.85	7,320
4	9.85	7,320	10.20	7,940	10.00	7,580	9.98	7,540	9.99	7,560	9.72	7,090
8	9.80	7,230	10.20	7,940	10.10	7,760	10.08	7,720	10.13	7,810	9.69	7,040
12	9.75	7,140	10.24	8,010	10.21	7,960	10.17	7,890	10.21	7,960	9.71	7,080
	May 29		May 30		May 31		June 1		June 2		June 3	
4	9.63	6,940	9.08	6,030	8.57	5,210	8.31	4,820	8.10	4,500	7.99	4,340
8	9.53	6,770	8.95	5,820	8.48	5,070	8.22	4,680	8.02	4,380	7.92	4,230
N	9.40	6,550	8.83	5,630	8.38	4,920	8.13	4,540	7.93	4,240	7.87	4,160
4	9.31	6,400	8.71	5,440	8.32	4,830	8.08	4,470	7.88	4,170	7.88	4,170
8	9.25	6,300	8.65	5,340	8.33	4,840	8.11	4,520	7.94	4,260	7.96	4,290
12	9.18	6,190	8.63	5,310	8.36	4,890	8.14	4,560	8.02	4,380	8.02	4,380
	June 4		June 5		June 6		June 7		June 8		June 9	
4	8.03	4,400	7.92	4,230	7.80	4,050	7.67	3,870	7.53	3,670	7.38	3,460
8	7.98	4,320	7.86	4,140	7.73	3,950	7.59	3,760	7.45	3,560	7.31	3,360
N	7.95	4,280	7.79	4,040	7.65	3,840	7.52	3,660	7.38	3,460	7.23	3,250
4	7.93	4,240	7.74	3,970	7.62	3,800	7.47	3,590	7.35	3,420	7.26	3,290
8	7.94	4,260	7.77	4,010	7.68	3,880	7.58	3,740	7.43	3,530	7.38	3,460
12	7.95	4,280	7.83	4,100	7.73	3,950	7.60	3,770	7.46	3,570	7.42	3,520
	June 10		June 11		June 12		June 13		June 14		June 15	
4	7.56	3,710	7.32	3,380	7.45	3,560	7.18	3,180	7.07	3,040	7.00	2,950
8	7.47	3,590	7.32	3,380	7.39	3,480	7.14	3,130	7.08	3,050	6.95	2,880
N	7.43	3,530	7.34	3,410	7.33	3,390	7.09	3,070	7.07	3,040	6.90	2,820
4	7.41	3,500	7.32	3,380	7.28	3,320	7.04	3,000	7.02	2,980	6.85	2,760
8	7.38	3,460	7.32	3,380	7.25	3,280	7.03	2,990	7.03	2,990	6.83	2,730
12	7.34	3,410	7.38	3,460	7.23	3,250	7.06	3,030	7.05	3,020	6.82	2,720
	June 16		June 17		June 18		June 19		June 20		June 21	
4	6.78	2,660										
8	6.76	2,640	6.91	2,830	6.84	2,740	6.65	2,500	6.46	2,270	6.27	2,040
N	6.80	2,690										
4	6.91	2,830	6.88	2,790	6.76	2,640	6.58	2,420	6.36	2,150	6.21	1,970
8	6.93	2,860										
12	6.92	2,850	6.89	2,810	6.72	2,590	6.53	2,360	6.33	2,120	6.17	1,920



## Moyle River at Eileen, Idaho

Location.- Lat. 48°46', long. 116°10', in NE $\frac{1}{4}$  sec. 35, T. 63 N., R. 2 E., an eighth of a mile downstream from Skin Creek, a quarter of a mile southeast of Eileen, and 4 miles upstream from mouth.

Drainage area.- 755 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements to 5,000 second-feet; extended to crest stage. Shift adjustments May 24-29 based on records for station at Eastport.

Maxima.- May-June 1948: Discharge, 9,650 second-feet 4 a.m. May 26 (gage height, 6.51 feet).

1925 to April 1948: Discharge, 8,780 second-feet Apr. 29, 1934 (gage height, 4.55 feet), from rating curve extended above 6,500 second-feet; maximum gage height, 4.8 feet, present datum, May 17, June 10, 11, 1927, May 13, 17-19, 1928.

Remarks.- No diversion or regulation above station.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	3,190	5,660	1,420	11	3,170	3,870	762	21	7,150	2,320	589
2	2,830	5,290	1,300	12	3,260	3,960	807	22	7,690	2,180	547
3	2,640	5,160	1,200	13	4,210	3,550	744	23	8,490	2,120	526
4	2,760	5,180	1,090	14	4,040	3,440	674	24	9,000	2,240	512
5	2,570	4,980	1,050	15	3,600	3,220	642	25	9,250	2,200	477
6	2,610	4,690	990	16	3,800	3,080	618	26	9,490	2,040	457
7	2,980	4,430	950	17	4,340	3,190	589	27	9,200	1,960	457
8	3,210	4,160	930	18	4,460	3,010	554	28	8,900	1,830	610
9	3,380	3,920	852	19	5,020	2,760	554	29	7,930	1,680	642
10	3,240	4,090	807	20	5,910	2,530	642	30	6,850	1,550	575
								31	6,170		526
Monthly mean discharge, in second-feet.....									5,205	3,343	745
Runoff, in inches.....									7.95	4.94	1.14

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	4.89	4,290	4.95	4,470	5.08	4,870	5.30	5,600	5.68	7,040	5.79	7,500
8	4.93	4,410	4.95	4,470	5.10	4,930	5.33	5,710	5.70	7,120	5.81	7,580
N	4.92	4,380	4.94	4,440	5.11	4,960	5.35	5,780	5.72	7,200	5.82	7,630
4	4.91	4,350	4.92	4,380	5.14	5,060	5.42	6,030	5.71	7,160	5.83	7,670
8	4.92	4,380	4.95	4,470	5.20	5,260	5.49	6,290	5.74	7,290	5.89	7,930
12	4.93	4,410	5.01	4,650	5.25	5,430	5.60	6,720	5.78	7,460	5.94	8,150
	May 23		May 24		May 25		May 26		May 27		May 28	
4	5.97	8,280	6.06	8,560	6.28	9,350	6.51	9,650	6.43	9,250	6.45	9,200
8	5.99	8,380	6.10	8,760	6.30	9,250	6.50	9,600	6.43	9,250	6.43	9,100
N	6.03	8,560	6.13	8,900	6.36	9,150	6.48	9,500	6.40	9,100	6.39	8,900
4	6.04	8,610	6.20	9,250	6.47	9,100	6.45	9,350	6.43	9,100	6.39	8,710
8	6.05	8,660	6.26	9,450	6.48	9,200	6.47	9,450	6.44	9,150	6.36	8,560
12	6.06	8,710	6.29	9,500	6.43	9,400	6.45	9,350	6.47	9,300	6.35	8,520
	May 29		May 30		May 31		June 1		June 2		June 3	
4	6.33	8,330					5.88	5,930	5.75	5,480	5.66	5,180
8	6.32	8,150	6.17	7,030	5.98	6,280	5.84	5,790	5.73	5,400	5.65	5,150
N	6.31	7,970					5.77	5,540	5.67	5,210	5.64	5,120
4	6.28	7,710	6.08	6,670	5.90	6,000	5.75	5,480	5.63	5,090	5.64	5,120
8	6.27	7,540					5.75	5,480	5.66	5,180	5.64	5,120
12	6.23	7,250	6.03	6,470	5.90	6,000	5.77	5,540	5.68	5,240	5.68	5,240
	June 4		June 5		June 6		June 7		June 8		June 9	
4	5.65	5,150			5.58	4,940	5.49	4,670	5.35	4,270	5.28	4,080
8	5.67	5,210	5.62	5,060	5.51	4,730	5.45	4,560	5.35	4,270	5.24	3,970
N	5.66	5,180			5.46	4,580	5.35	4,270	5.30	4,130	5.18	3,820
4	5.66	5,180	5.55	4,850	5.45	4,560	5.35	4,270	5.27	4,050	5.14	3,720
8	5.65	5,150			5.45	4,560	5.36	4,300	5.26	4,030	5.20	3,870
12	5.66	5,180	5.57	4,910	5.49	4,670	5.39	4,380	5.27	4,050	5.29	4,100
	June 10		June 11		June 12		June 13		June 14		June 15	
4	5.31	4,160							5.03	3,460	4.99	3,370
8	5.32	4,190	5.18	3,820	5.30	4,130	5.11	3,640	5.04	3,480	4.96	3,300
N	5.31	4,160							5.04	3,480	4.92	3,210
4	5.26	4,030	5.18	3,820	5.20	3,870	5.05	3,500	5.02	3,440	4.88	3,130
8	5.24	3,970					5.01	3,410	4.99	3,370	4.85	3,060
12	5.23	3,950	5.25	4,000	5.16	3,770	5.02	3,440	5.00	3,390	4.85	3,060
	June 16		June 17		June 18		June 19		June 20		June 21	
4	4.83	3,020										
8	4.83	3,020										
N	4.83	3,020	4.90	3,170	4.83	3,020	4.70	2,770	4.57	2,540	4.43	2,310
4	4.86	3,090										
8	4.91	3,190										
12	4.92	3,210	4.88	3,130	4.76	2,880	4.62	2,630	4.49	2,400	4.39	2,240

## Deep Creek at Moravia, Idaho

Location.- Lat. 48°38', long. 116°24', in sec. 18, T. 61 N., R. 1 E., at concrete highway bridge, 1 mile downstream from Ruby Creek and 1 mile southwest of Moravia.

Drainage area.- 133 square miles.

Gage-height record.- Staff gage read once daily to hundredths.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Shifting-control method used May 27 to July 31.

Maxima.- May-June 1948: Discharge observed, 1,110 second-feet 2:30 p.m. May 24 (gage height, 4.12 feet).

1928 to April 1948: Discharge observed, 1,300 second-feet Dec. 22, 1933; gage height observed, 4.46 feet May 6, 1945.

Remarks.- Small diversion above station for irrigation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	437	539	164	11	669	477	109	21	1,000	238	91
2	424	500	155	12	598	417	109	22	1,040	289	85
3	477	554	151	13	941	417	101	23	1,080	289	82
4	539	649	139	14	887	373	88	24	1,110	300	76
5	518	554	131	15	806	342	80	25	1,060	283	73
6	511	490	139	16	685	355	79	26	1,000	274	76
7	598	487	147	17	770	417	73	27	936	257	82
8	797	473	131	18	685	348	70	28	950	246	135
9	860	514	120	19	752	318	76	29	856	200	120
10	797	554	112	20	1,000	277	88	30	677	181	91
								31	550		79
Monthly mean discharge, in second-feet .....									775	387	105
Runoff, in inches .....									6.71	3.25	0.91

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
4	May 17 3.40	770	3:10	May 26 3.90	1,000	3	June 4 3.02	649	3	June 13 2.40	417
3:30	May 18 3.20	685	3	May 27 3.76	936	3	June 5 2.80	564	2:30	June 14 2.26	373
						4:10	2.74	543			
4	May 19 3.36	752	2:30	May 28 3.78	950	4:20	June 6 2.60	490	3	June 15 2.16	342
3	May 20 3.90	1,000	3	May 29 3.56	856	3:10	June 7 2.60	487	3	June 16 2.20	355
3	May 21 3.90	1,000	4:20	May 30 3.14	677	4	June 8 2.56	473	2:30	June 17 2.40	417
3:30	May 22 3.98	1,040	3	May 31 2.80	550	4	June 9 2.68	514	2:45	June 18 2.18	348
4:30	May 23 4.06	1,080	3:10	June 1 2.76	539	4:20	June 10 2.80	554	3	June 19 2.08	318
2:30	May 24 4.12	1,110	3	June 2 2.64	500	12:15	June 11 2.57	473	4	June 20 1.94	277
3	May 25 4.02	1,060	3	June 3 2.78	554	4	June 12 2.60	483	2:45	June 21 1.80	238
						3	2.40	417			

Note.- All readings made after noon.

## Long Canyon Creek near Porthill, Idaho

Location.- Lat. 48°57', long. 116°32', in NW¼ sec. 36, T. 65 N., R. 2 W., at U. S. Forest Service bridge at mouth of canyon, 4 miles southwest of Porthill. (See pl. 9B.)

Drainage area.- 29 square miles.

Gage-height record.- Water-stage recorder graph to 10 p.m. May 26, when gage was destroyed.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 205 second-feet.

Maxima.- May-June 1948: Discharge, 1,300 second-feet May 26 or 27, by slope-area method (gage height not determined).

1928 to April 1948: Daily discharge, 950 second-feet (estimated) June 15, 1933; gage height, 8.55 feet, present datum, June 14, 15, 1933 (drift jam).

Remarks.- No diversion above station.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	79			11	115			21	307		
2	74			12	120			22	320		
3	74			13	170			23	369		
4	77			14	158			24	366		
5	73			15	150			25	403		
6	79			16	158			26	429		
7	93			17	179			27			
8	113			18	186			28			
9	120			19	203			29			
10	115			20	254			30			
								31			

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	2.56	178	2.59	184	2.66	199	2.80	229	3.14	308	3.17	315
8	2.56	178	2.60	186	2.66	199	2.84	238	3.10	298	3.18	317
N	2.56	178	2.59	184	2.66	199	2.86	242	3.11	300	3.17	315
4	2.57	180	2.60	186	2.68	203	2.96	265	3.13	305	3.18	317
8	2.57	180	2.62	190	2.72	211	3.07	291	3.19	320	3.25	334
12	2.58	182	2.65	196	2.76	220	3.10	298	3.21	324	3.26	337
	May 23		May 24		May 25		May 26		May 27		May 28	
4	3.30	347	3.37	364	3.44	382	3.54	408				
8	3.38	367	3.38	367	3.39	370	3.52	403				
N	3.40	372	3.37	364	3.47	390	3.48	393				
4	3.50	398	3.33	354	3.46	388	3.55	411				
8	3.40	372	3.37	364	3.74	462	3.79	475				
12	3.37	364	3.38	367	3.55	411						

Supplemental record.- May 22, 6 p.m., 3.16 ft., 312 sec.-ft.; May 23, 6 p.m., 3.51 ft., 401 sec.-ft.; May 24, 6 p.m., 3.33 ft., 354 sec.-ft., 7 p.m., 3.47 ft., 390 sec.-ft.; 10 p.m., 3.45 ft., 385 sec.-ft.; May 25, 10 a.m., 3.51 ft., 401 sec.-ft.; 10 p.m., 3.82 ft., 484 sec.-ft.; May 26, 1 a.m., 3.65 ft., 438 sec.-ft., 10 p.m., 4.07 ft., 544 sec.-ft.

## Smith Creek near Porthill, Idaho

Location.- Lat. 48°57'40", long. 116°33'20", in NE<sup>1</sup> sec. 26, T. 65 N., R. 2 W., at U. S. Forest Service bridge, 1 mile south of Smith Creek ranger station and 4 miles southwest of Porthill.

Drainage area.- 70 square miles.

Gage-height record.- Water-stage recorder graph except periods 4:30 p.m. June 12 to 9 p.m. June 13, 5:30 a.m. June 14 to 1:30 p.m. June 15, for which gage heights were computed on basis of recorder graph for Boundary Creek near Porthill.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 1,500 second-feet and extended to peak stage. Shifting-control method used May 1-26. Maxima.- May 1948: Discharge, 2,480 second-feet 9 p.m. May 27 (gage height, 7.37 feet).

1928 to April 1948: Discharge, 3,150 second-feet May 17, 1941 (gage height, 7.36 feet, site then in use), from rating curve extended above 1,600 second-feet.

Remarks.- No diversion above station.

## Mean discharge, in second-feet, 1948

mean discharge, in second-feet, 1948											
Day	May	June	July	Day	May	June	July	Day	May	June	July
1	260	1,420	254	11	370	1,270	130	21	1,420	519	94
2	239	1,450	220	12	406	1,160	124	22	1,440	518	84
3	239	1,470	198	13	640	955	131	23	1,410	480	77
4	247	1,530	175	14	522	845	111	24	1,290	719	79
5	227	1,480	207	15	465	781	106	25	1,400	522	71
6	260	1,470	196	16	541	988	104	26	1,640	473	65
7	326	1,540	192	17	669	860	92	27	1,930	420	82
8	386	1,540	188	18	681	700	108	28	1,880	370	156
9	413	1,400	155	19	864	630	111	29	1,590	326	112
10	376	1,300	139	20	1,310	562	107	30	1,320	292	92
								31	1,310		80
Monthly mean discharge, in second-feet.....									841	933	130
Runoff, in inches .....									13.85	14.87	2.15

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	4.48	675	4.46	675	4.65	766	5.35	1,160	5.68	1,360	5.86	1,480
8	4.47	670	4.42	657	4.64	761	5.39	1,180	5.51	1,260	5.74	1,410
N	4.45	661	4.40	648	4.66	771	5.60	1,310	5.63	1,330	5.67	1,370
4	4.45	661	4.44	666	4.89	889	5.80	1,430	5.85	1,460	5.76	1,420
8	4.47	670	4.57	724	5.19	1,050	5.90	1,490	6.04	1,580	5.83	1,460
12	4.48	675	4.65	761	5.32	1,130	5.83	1,440	5.96	1,530	5.86	1,480
	May 23		May 24		May 25		May 26		May 27		May 28	
4	5.84	1,470	5.53	1,300	5.61	1,350	6.00	1,590	6.28	1,770	6.76	2,070
8	5.80	1,450	5.47	1,260	5.46	1,260	5.82	1,490	6.09	1,650	6.40	1,840
N	5.74	1,410	5.40	1,220	5.35	1,200	5.64	1,380	6.00	1,600	6.17	1,700
4	5.66	1,370	5.44	1,250	5.66	1,380	6.07	1,640	6.69	2,030	6.26	1,760
8	5.66	1,370	5.61	1,350	6.11	1,650	6.52	1,910	7.22	2,370	6.58	1,830
12	5.57	1,310	5.72	1,410	6.17	1,690	6.48	1,890	7.16	2,330	6.28	1,770
	May 29		May 30		May 31		June 1		June 2		June 3	
4	6.18	1,710	5.68	1,410	5.52	1,310	5.67	1,400	5.74	1,440	5.85	1,510
8	6.00	1,600	5.49	1,290	5.37	1,220	5.51	1,310	5.52	1,310	5.65	1,390
N	5.84	1,500	5.34	1,200	5.27	1,160	5.44	1,260	5.31	1,190	5.52	1,310
4	5.88	1,530	5.38	1,240	5.46	1,280	5.79	1,470	5.70	1,420	5.66	1,400
8	5.92	1,550	5.60	1,360	5.73	1,440	5.93	1,560	6.13	1,680	5.93	1,560
12	5.81	1,490	5.65	1,390	5.77	1,460	5.94	1,560	6.13	1,680	5.97	1,580
	June 4		June 5		June 6		June 7		June 8		June 9	
4	5.89	1,530	5.81	1,490	5.79	1,470	5.83	1,500	5.83	1,500	5.72	1,430
8	5.78	1,470	5.62	1,370	5.50	1,300	5.57	1,340	5.58	1,350	5.41	1,250
N	5.78	1,470	5.49	1,290	5.29	1,170	5.41	1,250	5.47	1,280	5.29	1,170
4	5.89	1,530	5.78	1,470	5.77	1,460	6.00	1,600	6.03	1,620	5.78	1,470
8	6.02	1,610	6.08	1,650	6.22	1,730	6.42	1,850	6.38	1,830	5.94	1,560
12	5.98	1,590	6.02	1,610	6.10	1,660	6.15	1,690	6.04	1,620	5.73	1,440
	June 10		June 11		June 12		June 13		June 14		June 15	
4	5.49	1,290	5.23	1,140	5.63	1,380						
8	5.45	1,270	5.39	1,230	5.29	1,170						
N	5.68	1,410	5.33	1,200	5.55	1,330						
4	5.55	1,330	5.28	1,170	5.49	1,290						
8	5.38	1,230	5.82	1,490								
12	5.20	1,120	5.94	1,560							4.68	835
	June 16		June 17		June 18		June 19		June 20		June 21	
4	4.57	781	4.98	999	4.43	715	4.33	670	4.16	598	3.98	525
8	4.67	830	4.80	900	4.36	683	4.21	618	4.05	553	3.93	506
N	5.01	1,020	4.65	820	4.28	648	4.10	573	3.98	525	3.91	499
4	5.38	1,230	4.55	771	4.31	661	4.12	581	3.99	529	3.93	506
8	5.20	1,120	4.53	761	4.51	752	4.29	653	4.09	569	3.98	525
12	5.11	1,070	4.50	747	4.47	733	4.26	640	4.07	561	4.04	549

Supplemental record.- May 21, 9 a.m., 5.63 ft., 1,330 sec.-ft.; May 22, 9 a.m., 5.68 ft., 1,370 sec.-ft.; May 26, 10 p.m., 6.62 ft., 1,980 sec.-ft.; May 27, 11 a.m., 5.98 ft., 1,590 sec.-ft., 9 p.m., 7.37 ft., 2,480 sec.-ft.; May 30, 2 p.m., 5.31 ft., 1,190 sec.-ft.; June 2, 10 p.m., 6.23 ft., 1,740 sec.-ft.; June 5, 9:30 p.m., 6.13 ft., 1,680 sec.-ft.; June 6, 9 p.m., 6.29 ft., 1,770 sec.-ft.; June 8, 10 a.m., 5.48 ft., 1,290 sec.-ft.; June 9, 10 a.m., 5.31 ft., 1,190 sec.-ft., 5 p.m., 5.88 ft., 1,530 sec.-ft.; June 11, 2 a.m., 5.17 ft., 1,100 sec.-ft., 6 a.m., 5.40 ft., 1,240 sec.-ft., 10 p.m., 6.04 ft., 1,620 sec.-ft.; June 16, 10 a.m., 4.93 ft., 972 sec.-ft., 2 p.m., 5.11 ft., 1,070 sec.-ft.

Boundary Creek near Porthill, Idaho  
(International gaging station)

Location.- Lat. 46°59'50", long. 116°34'05", in SW $\frac{1}{4}$  sec. 11, T. 65 N., R. 2 W., 140 feet downstream from bridge at mouth of canyon, 0.2 mile south of international boundary, and 3 miles west of Porthill.

Drainage area.- 97 square miles.

Gage-height record.- Water-stage recorder graph except for period May 5-10, when there was no gage-height record.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 1,430 second-feet and extended to peak stage. Discharge for period of no gage-height record computed on basis of records for Smith Creek near Porthill.

Maxima.- May-June 1948: Discharge, 2,530 second-feet 12:30 a.m. May 28 (gage height, 5.34 feet).

1928 to April 1948: Discharge, 2,400 second-feet June 15, 1933 (gage height, 5.22 feet), from rating curve extended above 1,500 second-feet.

Remarks.- No diversion above station. This station is one of the international gaging stations maintained by the United States under agreement with Canada.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	328	1,450	250	11	431	1,220	149	21	1,550	508	103
2	298	1,420	226	12	498	1,170	145	22	1,600	480	96
3	294	1,410	206	13	730	918	145	23	1,670	458	89
4	312	1,440	188	14	630	827	130	24	1,540	635	90
5	280	1,400	206	15	557	762	123	25	1,550	530	82
6	340	1,350	201	16	625	838	123	26	1,820	480	77
7	400	1,380	198	17	805	789	111	27	2,040	414	90
8	450	1,360	206	18	815	669	114	28	1,970	359	160
9	490	1,280	173	19	965	594	121	29	1,610	320	121
10	440	1,230	158	20	1,380	546	109	30	1,360	284	98
								31	1,310		87
Monthly mean discharge, in second-feet .....									938	884	141
Runoff, in inches .....									11.15	10.17	1.68

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	3.32	809	3.33	815	3.45	897	3.97	1,280	4.41	1,640	4.43	1,660
8			3.30	797	3.44	890	3.96	1,270	4.19	1,460	4.35	1,600
N	3.31	803	3.37	839	3.42	878	4.04	1,330	4.15	1,430	4.22	1,490
8			3.27	780	3.50	931	4.12	1,400	4.25	1,510	4.27	1,530
8	3.31	803	3.33	815	3.79	1,130	4.33	1,570	4.35	1,590	4.43	1,660
12	3.33	815	3.42	871	3.92	1,230	4.46	1,670	4.41	1,640	4.47	1,690
	May 23		May 24		May 25		May 26		May 27		May 28	
4	4.48	1,710	4.35	1,610	4.32	1,590	4.67	1,880	4.87	2,070	5.13	2,320
8	4.50	1,730	4.30	1,570	4.16	1,460	4.54	1,770	4.73	1,950	4.80	2,010
N	4.48	1,710	4.22	1,500	4.12	1,430	4.40	1,660	4.62	1,850	4.57	1,810
8	4.39	1,640	4.17	1,460	4.12	1,430	4.35	1,620	4.62	1,850	4.44	1,700
8	4.32	1,580	4.20	1,490	4.38	1,640	4.78	1,980	5.03	2,220	4.56	1,800
12	4.35	1,610	4.34	1,600	4.70	1,900	4.96	2,140	5.28	2,470	4.65	1,880
	May 29		May 30		May 31		June 1		June 2		June 3	
4	4.55	1,790	4.11	1,440	4.05	1,390	4.10	1,430	4.10	1,420	4.11	1,430
8	4.38	1,650	4.07	1,410	3.95	1,310	4.05	1,390	3.98	1,330	4.01	1,350
N	4.25	1,550	3.97	1,330	3.86	1,240	4.05	1,390	3.86	1,230	3.93	1,290
8	4.15	1,470	3.89	1,260	3.83	1,210	4.13	1,450	4.02	1,360	4.01	1,350
8			3.91	1,280	3.92	1,290	4.28	1,570	4.33	1,610	4.15	1,460
12	4.19	1,500	4.06	1,400	4.11	1,440	4.22	1,530	4.32	1,600	4.21	1,510
	June 4		June 5		June 6		June 7		June 8		June 9	
4	4.11	1,420	4.09	1,410	4.04	1,360	4.03	1,350	4.01	1,330	3.89	1,230
8	4.05	1,370	3.99	1,330	3.88	1,230	3.87	1,220	3.85	1,203	3.81	1,170
N	4.07	1,390	3.90	1,250	3.84	1,200	3.84	1,200	3.82	1,180	3.74	1,120
4	4.12	1,430	4.07	1,390	4.00	1,330	4.13	1,430	4.13	1,420	4.06	1,370
8	4.21	1,500	4.24	1,530	4.28	1,550	4.35	1,610	4.30	1,560	4.13	1,420
12	4.22	1,510	4.14	1,450	4.17	1,460	4.18	1,470	4.10	1,400	4.05	1,360
	June 10		June 11		June 12		June 13		June 14		June 15	
4	3.85	1,190	3.71	1,090	3.99	1,290	3.54	966	3.58	852	3.25	774
8	3.83	1,180	3.81	1,160	3.82	1,160	3.46	910	3.32	815	3.19	741
N	4.07	1,370			3.73	1,100	3.39	864	3.28	791	3.14	714
4	3.93	1,250	3.82	1,170	3.69	1,070	3.38	858	3.28	791	3.18	736
8	3.81	1,160	4.12	1,410	3.74	1,110	3.49	931	3.38	852	3.31	809
12	3.72	1,100	4.24	1,500	3.66	1,050	3.45	904	3.33	821	3.25	774
	June 16		June 17		June 18		June 19		June 20		June 21	
4	3.18	736	3.43	878			2.95	610	2.87	566	2.75	512
8	3.26	780	3.32	809	3.06	665						
N	3.38	852			3.00	635	2.86	566	2.78	526	2.71	494
4	3.51	938	3.20	741	3.01	640	2.85	562			2.72	498
8	3.45	897			3.10	686	2.90	585	2.80	534	2.77	521
12	3.42	878	3.17	724	3.05	660	2.97	620	2.78	526	2.75	512

Supplemental record.- May 27, 3 p.m., 4.56 ft., 1,800 sec.-ft.; May 28, 12:30 a.m., 5.34 ft., 2,530 sec.-ft.; June 7, 7 p.m., 4.38 ft., 1,630 sec.-ft.; June 8, 7 p.m., 4.32 ft., 1,570 sec.-ft.; June 10, 10 a.m., 4.02 ft., 1,330 sec.-ft.; June 11, 2 a.m., 3.67 ft., 1,060 sec.-ft., 10 p.m., 4.32 ft., 1,570 sec.-ft.; June 19, 10 p.m., 2.98 ft., 625 sec.-ft.

## Slocan River at Crescent Valley, British Columbia

Location.- Lat. 49°29'57", long. 117°37'24", three-quarters of a mile upstream from

Crescent Valley post office.

Drainage area.- 1,270 square miles.

Gage-height record.- Water-stage recorder graph except for periods June 6, 7, 11-14, when there was no gage-height record.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Discharge for periods of no gage-height record estimated.

Maxima.- May-June 1948: Discharge, 24,700 second-feet 4 p.m. June 10 (gage height, 14.84 feet).

1913-15, 1925 to April 1948: Discharge, 24,000 second-feet May 27, 1928.

Remarks.- Records furnished by Dominion Water and Power Bureau, Department of Mines and Resources, Canada.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	3,460	17,300	6,660	11	3,880	22,200	4,210	21	10,500	11,400	3,260
2	3,300	17,900	6,150	12	4,050	20,500	4,320	22	11,400	10,500	3,130
3	3,220	18,900	5,670	13	4,720	18,900	4,260	23	12,100	9,590	3,040
4	3,340	20,200	5,300	14	4,860	17,200	4,010	24	13,800	9,100	3,090
5	3,270	20,200	5,220	15	4,620	15,500	3,820	25	13,800	8,620	2,960
6	3,260	20,600	5,260	16	4,620	14,900	3,700	26	15,600	8,220	2,800
7	3,520	21,100	4,970	17	5,560	14,200	3,570	27	18,300	7,840	2,740
8	3,680	21,500	4,830	18	6,220	13,100	3,480	28	20,300	7,620	2,840
9	3,770	21,700	4,540	19	6,460	12,200	3,450	29	19,200	7,440	2,780
10	3,800	23,900	4,290	20	7,940	11,700	3,390	30	17,500	7,140	2,690
								31	17,000		2,590
Monthly mean discharge, in second-feet.....									8,290	15,000	3,970
Runoff, in inches.....									7.53	13.18	3.61

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	6.82	5,130	7.47	6,170	7.61	6,410	8.02	7,160	9.47	10,200	9.99	11,400
8	6.98	5,370	7.49	6,200	7.61	6,410	8.18	7,560	9.60	10,400	10.03	11,500
N	7.12	5,590	7.50	6,220	7.60	6,390	8.34	7,780	9.63	10,500	10.01	11,400
4	7.23	5,770	7.48	6,190	7.61	6,410	8.52	8,140	9.64	10,500	9.98	11,300
8	7.31	5,900	7.51	6,240	7.66	6,500	8.84	8,780	9.69	10,700	9.97	11,300
12	7.41	6,070	7.57	6,340	7.84	6,820	9.23	9,620	9.86	11,100	10.02	11,400
	May 23		May 24		May 25		May 26		May 27		May 28	
4	10.06	11,500	10.96	13,800	10.99	13,900	11.53	15,300	12.52	18,000	13.55	20,900
8	10.11	11,700	10.99	13,900	10.95	13,800	11.57	15,400	12.54	18,100	13.45	20,600
N	10.24	12,000	10.98	13,800	10.86	13,500	11.50	15,200	12.52	18,000	13.30	20,200
4	10.42	12,400	10.93	13,700	10.82	13,400	11.52	15,300	12.50	18,000	13.20	19,900
8	10.61	12,900	10.92	13,700	10.97	13,800	11.88	16,300	12.90	19,100	13.20	19,900
12	10.82	13,400	10.96	13,800	11.31	14,700	12.35	17,500	13.37	20,400	13.25	20,000
	May 29		May 30		May 31		June 1		June 2		June 3	
4	13.23	20,000	12.51	18,000	12.22	17,200	12.23	17,200	12.55	18,100	12.80	18,800
8	13.13	19,700	12.40	17,700	12.17	17,000	12.21	17,100	12.48	17,900	12.73	18,600
N	12.98	19,300	12.28	17,300	12.07	16,800	12.19	17,100	12.40	17,700	12.65	18,400
4	12.78	18,700	12.17	17,000	12.02	16,600	12.18	17,100	12.38	17,600	12.75	18,600
8	12.68	18,500	12.14	17,000	12.04	16,700	12.30	17,400	12.58	18,200	13.07	19,500
12	12.60	18,200	12.23	17,200	12.17	17,000	12.50	18,000	12.77	18,700	13.34	20,300
	June 4		June 5		June 6		June 7		June 8		June 9	
4	13.36	20,400	13.38	20,400	13.42	20,500			13.82	21,700	13.98	22,100
8	13.30	20,200	13.28	20,100	13.28	20,100			13.74	21,400	13.82	21,700
N	13.22	20,000	13.13	19,700	13.12	19,700			13.12	19,700	13.65	21,200
4	13.25	20,000	13.10	19,600			13.30	20,200	13.12	19,700	13.60	21,000
8	13.32	20,200	13.35	20,300			13.60	21,000	13.88	21,900	13.80	21,600
12	13.40	20,500	13.50	20,800			13.83	21,700	14.05	22,300	14.12	22,500
	June 10		June 11		June 12		June 13		June 14		June 15	
4	14.50	23,100	14.35	23,200							11.78	16,000
8	14.45	23,500	14.05	22,300							11.69	15,700
N	14.75	24,400	13.80	21,600					11.88	16,300	11.58	15,400
4	14.84	24,700							11.88	16,300	11.43	15,000
8	14.80	24,600							11.81	16,100	11.41	15,000
12	14.62	24,000							11.89	16,300	11.48	15,200
	June 16		June 17		June 18		June 19		June 20		June 21	
4	11.48	15,200	11.34	14,800	10.90	13,600	10.49	12,600	10.25	12,000	10.07	11,600
8	11.38	14,900	11.18	14,400	10.80	13,400	10.40	12,400	10.19	11,800	10.11	11,700
N	11.32	14,700	11.13	14,200	10.70	13,100	10.30	12,100	10.10	11,600	10.07	11,600
4	11.31	14,700	11.01	13,900	10.58	12,800	10.20	11,900	10.02	11,400	9.97	11,300
8	11.38	14,900	10.98	13,800	10.58	12,800	10.21	11,900	10.01	11,400	9.91	11,200
12	11.38	14,900	10.98	13,800	10.54	12,700	10.27	12,000	10.05	11,500	9.89	11,100

Pend Oreille River Basin

Clark Fork above Missoula, Mont.

Location.- Lat. 46°53', long. 113°56', in NW $\frac{1}{4}$  sec. 19, T. 13 N., R. 18 W., 3 miles downstream from Blackfoot River and 3 miles east of Missoula.

Drainage area.- 5,740 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 31,500 second-feet 3 p.m. May 23 (gage height, 13.07 feet).

1929 to April 1948: Discharge, 24,200 second-feet May 9, 1947 (gage height, 11.10 feet).

Remarks.- Flow partly regulated by power plant at Bonner. Several diversions above station for irrigation.

*Mean discharge, in second-feet, 1948*

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	8,130	22,100	7,960	11	10,700	17,600	4,260	21	26,200	10,000	4,540
2	7,960	21,100	8,040	12	10,200	17,100	4,770	22	28,200	10,600	4,220
3	7,500	21,100	8,350	13	10,100	16,100	4,680	23	28,800	11,200	3,880
4	7,280	23,800	7,150	14	10,400	15,000	4,370	24	27,600	11,600	3,760
5	7,260	25,300	6,670	15	10,600	13,500	4,200	25	25,400	11,600	3,670
6	6,930	24,600	5,970	16	10,600	12,500	4,040	26	25,000	11,500	3,480
7	7,350	23,200	5,850	17	10,800	12,500	4,350	27	25,300	10,600	3,310
8	10,200	21,400	5,510	18	13,000	12,000	3,280	28	25,300	9,880	3,330
9	11,700	19,800	5,180	19	16,200	11,100	4,310	29	25,900	9,110	3,530
10	11,500	18,500	5,120	20	20,900	10,500	4,660	30	25,100	8,450	3,650
								31	23,400		3,440
Monthly mean discharge, in second-feet .....									15,980	15,420	4,823
Runoff, in inches .....									3.20	3.00	0.97

*Gage height, in feet, and discharge, in second-feet, at indicated time, 1948*

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	6.98	10,500	7.41	11,700	8.49	15,100	9.57	18,700	11.09	24,200	12.25	28,400
8	6.98	10,500	7.61	12,300	8.65	15,600	9.81	19,600	11.25	24,700	12.07	27,700
N	7.07	10,700	7.84	13,000	8.82	16,200	10.07	20,500	11.50	25,600	12.00	27,500
4	7.14	10,900	8.07	13,700	8.97	16,700	10.77	23,000	12.15	28,000	12.30	28,600
8	7.21	11,100	8.23	14,300	9.14	17,300	10.79	23,100	12.47	29,300	12.30	28,600
12	7.31	11,400	8.37	14,700	9.36	18,000	11.05	24,000	12.37	28,900	12.20	28,200
	May 23		May 24		May 25		May 26		May 27		May 28	
4	12.17	28,100	12.33	28,700	11.55	25,800	11.28	24,800	11.36	25,100	11.32	25,000
8	12.25	28,400	12.17	28,100	11.55	25,800	11.33	25,000	11.42	25,400	11.38	25,200
N	11.97	27,400	12.02	27,600	11.40	25,500	11.27	24,800	11.47	25,500	11.39	25,200
4	12.85	30,700	11.88	27,000	11.40	25,500	11.48	25,600	11.40	25,300	11.45	25,500
8	12.42	29,100	11.71	26,400	11.33	25,000	11.29	24,900	11.40	25,300	11.53	25,700
12	12.40	29,000	11.62	26,100	11.28	24,800	11.34	25,100	11.38	25,200	11.51	25,700
	May 29		May 30		May 31		June 1		June 2		June 3	
4	11.58	25,900	11.50	25,600	10.99	23,800	10.65	22,600	10.35	21,500	10.14	20,700
8	11.68	26,300	11.41	25,300	10.93	23,600	10.58	22,300	10.33	21,400	10.20	21,000
N	11.65	26,200	11.35	25,100	10.92	23,600	10.51	22,100	10.22	21,000	10.17	20,900
4	11.53	25,700	11.30	24,900	10.83	23,200	10.48	22,000	10.18	20,900	10.16	20,800
8	11.52	25,700	11.26	24,800	10.71	22,800	10.36	21,500	10.16	20,800	10.42	21,700
12	11.52	25,700	11.17	24,500	10.70	22,800	10.38	21,600	10.17	20,900	10.58	22,300
	June 4		June 5		June 6		June 7		June 8		June 9	
4	10.66	22,600	11.39	25,200	11.30	24,900	11.00	23,800	10.48	22,000	10.02	20,300
8	10.80	23,100	11.54	25,800	11.28	24,800	10.95	23,700	10.38	21,600	10.01	20,300
N	11.02	23,900	11.45	25,500	11.18	24,500	10.78	23,000	10.27	21,200	9.80	19,500
4	11.22	24,600	11.40	25,300	11.22	24,600	10.73	22,900	10.23	21,100	9.84	19,700
8	11.25	24,700	11.40	25,300	11.18	24,500	10.58	22,300	10.19	20,900	9.76	19,400
12	11.32	25,000	11.25	24,700	11.12	24,300	10.56	22,300	10.06	20,500	9.66	19,000
	June 10		June 11		June 12		June 13		June 14		June 15	
4	9.61	18,900	9.33	17,900	9.14	17,300	8.95	16,600	8.57	15,300	8.19	14,100
8	9.56	18,700	9.29	17,800	9.16	17,300	8.86	16,300	8.55	15,300	8.08	13,800
N	9.50	18,500	9.20	17,500	9.13	17,200	8.79	16,100	8.48	15,100	7.99	13,500
4	9.46	18,300	9.17	17,400	9.10	17,100	8.74	15,900	8.40	14,800	8.05	13,700
8	9.41	18,200	9.14	17,300	9.04	16,900	8.66	15,600	8.34	14,600	7.83	13,000
12	9.37	18,000	9.15	17,300	9.01	16,800	8.60	15,400	8.25	14,300	7.78	12,800
	June 16		June 17		June 18		June 19		June 20		June 21	
4	7.71	12,600	7.50	12,000	7.58	12,200	7.30	11,400	7.05	10,700	6.86	10,100
8	7.65	12,400	7.52	12,100	7.54	12,100	7.25	11,200	7.03	10,600	6.83	10,000
N	7.60	12,300	7.58	12,200	7.50	12,000	7.19	11,100	7.01	10,500	6.82	10,000
4	7.54	12,100	7.67	12,500	7.47	11,900	7.14	10,900	6.99	10,500	6.80	9,960
8	7.53	12,100	7.67	12,500	7.43	11,800	7.09	10,800	6.96	10,400	6.82	10,000
12	7.52	12,100	7.64	12,400	7.35	11,600	7.08	10,800	6.91	10,300	6.84	10,100

Supplemental record.- May 20, 3 p.m., 10.29 ft., 21,300 sec.-ft.; May 21, 2 p.m., 11.40 ft., 25,300 sec.-ft.; May 23, 10 a.m., 12.22 ft., 28,300 sec.-ft., 2 p.m., 12.62 ft., 29,800 sec.-ft., 3 p.m., 13.07 ft., 31,500 sec.-ft., 6 p.m., 12.52 ft., 29,500 sec.-ft.; June 15, 5 p.m., 7.70 ft., 12,600 sec.-ft.

## Clark Fork below Missoula, Mont.

Location.- Lat. 46°52', long. 114°07', in SE $\frac{1}{4}$  sec. 21, T. 13 N., R. 20 W., 2 miles downstream from Bitterroot River and 6 miles west of Missoula.

Drainage area.- 8,690 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 52,800 second-feet 6 to 7 p.m. May 23 (gage height, 12.08 feet).

1929 to April 1948: Discharge, 45,900 second-feet May 10, 1947 (gage height, 11.18 feet).

Remarks.- Some regulation by power plant at Bonner. Many diversions above station for irrigation.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	12,900	45,800	14,800	11	15,800	35,600	7,280	21	42,600	20,000	7,100
2	12,600	43,400	14,600	12	14,900	34,200	7,690	22	48,500	21,200	6,800
3	12,100	43,600	14,600	13	14,700	31,800	7,590	23	51,700	21,600	6,230
4	11,600	47,400	13,200	14	15,800	29,900	7,010	24	49,400	21,200	5,930
5	11,300	48,000	12,400	15	16,800	27,100	6,590	25	45,600	21,000	5,730
6	10,700	45,100	11,100	16	16,700	24,900	6,203	26	45,100	20,400	5,480
7	11,100	42,600	10,300	17	17,400	24,700	6,410	27	46,900	19,200	5,170
8	14,800	40,900	9,600	18	21,000	23,400	5,480	28	49,000	18,000	5,120
9	17,300	39,600	8,840	19	26,900	21,300	6,100	29	51,200	16,700	5,560
10	16,900	38,100	8,600	20	33,900	20,700	6,980	30	52,000	15,600	5,960
								31	50,500		5,900
Monthly mean discharge, in second-feet.....									27,670	30,100	8,076
Runoff, in inches.....									3.67	3.86	1.07

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height		Discharge		Gage height		Discharge		Gage height		Discharge		Gage height		Discharge		Gage height		Discharge		
	May 17		May 18		May 19		May 20		May 21				May 22								
4	6.34	16,800	6.85	19,100	8.02	25,000	9.04	31,000	10.36	39,800			11.31	46,700							
N	6.37	17,000	7.00	19,800	8.20	26,000	9.25	32,300	10.57	41,300			11.37	47,200							
8	6.42	17,200	7.20	20,800	8.37	26,900	9.47	33,800	10.80	42,900			11.48	48,000							
4	6.49	17,500	7.42	21,900	8.55	28,000	9.70	35,200	10.96	44,100			11.64	49,300							
8	6.59	18,000	7.65	23,000	8.68	28,800	9.97	37,100	11.15	45,500			11.87	51,200							
12	6.71	18,500	7.83	24,000	8.85	29,800	10.15	38,400	11.15	45,600			11.89	51,300							
May 23		May 24		May 25		May 26		May 27		May 28											
4	11.90	51,400	11.84	50,900	11.25	46,300	11.04	44,700	11.25	46,300			11.49	48,100							
N	11.95	51,800	11.78	50,400	11.18	45,800	11.07	44,900	11.30	46,600			11.56	48,700							
8	11.97	52,000	11.69	49,700	11.16	45,600	11.10	45,200	11.33	46,900			11.60	49,000							
4	11.88	51,200	11.57	48,800	11.11	45,200	11.09	45,100	11.44	47,700			11.65	49,400							
8	12.02	52,400	11.45	47,800	11.08	45,000	11.17	45,700	11.40	47,400			11.70	49,800							
12	11.90	51,400	11.33	46,900	11.06	44,800	11.17	45,700	11.43	47,600			11.77	50,400							
May 29		May 30		May 31		June 1		June 2		June 3											
4	11.82	50,800	11.97	52,000	11.92	51,600	11.38	47,200	10.95	44,000			10.81	43,000							
N	11.84	50,900	11.98	52,000	11.86	51,100	11.27	46,400	10.90	43,600			10.85	43,300							
8	11.88	51,200	11.97	52,000	11.81	50,700	11.22	46,000	10.86	43,400			10.87	43,400							
4	11.90	51,400	11.95	51,800	11.68	49,600	11.11	45,200	10.82	43,000			10.90	43,600							
8	11.92	51,600	11.99	52,100	11.64	49,300	10.96	44,100	10.77	42,700			10.99	43,300							
12	11.94	51,700	11.97	52,000	11.47	48,000	10.98	44,200	10.80	42,900			11.08	45,000							
June 4		June 5		June 6		June 7		June 8		June 9											
4	11.23	46,100	11.54	48,500	11.22	46,000	10.88	43,500	10.60	41,500			10.38	40,000							
N	11.32	46,800	11.52	48,400	11.17	45,700	10.82	43,000	10.58	41,400			10.37	39,900							
8	11.44	47,700	11.52	48,400	11.09	45,100	10.78	42,800	10.54	41,100			10.37	39,900							
4	11.54	48,500	11.46	47,900	11.02	44,600	10.72	42,300	10.48	40,700			10.29	39,300							
8	11.54	48,500	11.37	47,200	10.97	44,200	10.62	41,600	10.42	40,200			10.26	39,100							
12	11.54	48,500	11.31	46,700	10.92	43,800	10.60	41,500	10.39	40,000			10.23	38,900							
June 10		June 11		June 12		June 13		June 14		June 15											
4	10.21	38,800	9.87	36,400	9.58	34,500	9.34	32,900	8.97	30,500			8.60	28,300							
N	10.21	38,800	9.82	36,000	9.60	34,600	9.24	32,300	8.94	30,300			8.50	27,700							
8	10.14	38,300	9.74	35,500	9.58	34,500	9.14	31,600	8.89	30,000			8.58	27,000							
4	10.06	37,700	9.68	35,100	9.53	34,100	9.08	31,200	8.82	29,600			8.56	26,900							
8	9.98	37,200	9.63	34,800	9.46	33,700	9.05	31,000	8.76	29,300			8.20	26,000							
12	9.93	36,800	9.59	34,500	9.40	33,300	9.00	30,700	8.69	28,800			8.15	25,700							
June 16		June 17		June 18		June 19		June 20		June 21											
4	8.08	25,300	7.99	24,800	7.85	24,100	7.45	22,000	7.19	20,800			7.05	20,000							
N	8.02	25,000	7.97	24,700	7.78	23,700	7.38	21,700	7.21	20,800			7.03	20,000							
8	7.93	24,500	7.95	24,600	7.71	23,400	7.28	21,200	7.17	20,600			7.02	19,900							
4	7.93	24,500	7.97	24,700	7.65	23,000	7.20	20,800	7.17	20,600			7.02	19,900							
8	8.00	24,900	7.95	24,600	7.58	22,700	7.18	20,700	7.15	20,600			7.03	20,000							
12	8.01	25,000	7.91	24,400	7.53	22,400	7.18	20,700	7.11	20,400			7.07	20,200							

Supplemental record.- May 23, 2 p.m., 11.80 ft., 50,600 sec.-ft., 6 p.m., 12.08 ft., 52,800 sec.-ft.; May 26, 6 p.m., 11.04 ft., 44,700 sec.-ft.; May 31, 6 a.m., 12.02 ft., 52,400 sec.-ft.



## Clark Fork at Tarkio, Mont.

Location.- Lat. 47°01', long. 114°44', in NE $\frac{1}{4}$  sec. 34, T. 15 N., R. 25 W., a quarter of a mile west of Tarkio,  $1\frac{1}{2}$  miles upstream from Quartz Creek, and  $3\frac{1}{2}$  miles downstream from Fish Creek.

Drainage area.- 9,630 square miles.

Gage-height record.- Graph constructed from once-daily gage readings and compared with water-stage recorder graph for stations below Missoula and at St. Regis. No gage-height record May 20, June 12.

Discharge record.- Stage-discharge relation defined by current-meter measurements. Gage heights used to hundredths. Shifting-control method used July 5-31. Discharge for days of no gage-height record computed on basis of records for stations below Missoula and at St. Regis.

Maxima.- May-June 1948: Discharge, 63,200 second-feet 12 p.m. May 30 (gage height, 30.35 feet, from graph based on gage readings).  
1944 to April 1948: Discharge observed, 57,200 second-feet May 10, 1947 (gage height, 27.60 feet).

Remarks.- Some regulation by power plant at Bonner. Many diversions above station.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	15,500	57,600	16,200	11	19,000	42,700	8,460	21	49,100	22,000	7,660
2	15,500	54,300	15,600	12	18,100	39,000	8,250	22	57,100	22,100	7,520
3	14,600	53,300	15,600	13	17,700	37,400	8,460	23	62,300	25,700	7,030
4	13,700	55,200	14,600	14	18,500	35,000	8,080	24	62,300	22,600	6,580
5	13,500	57,900	13,500	15	19,400	32,200	7,830	25	60,400	22,600	6,390
6	13,200	55,800	12,600	16	19,300	29,300	7,250	26	56,800	22,500	6,190
7	13,400	52,400	11,800	17	20,000	28,100	6,870	27	57,600	21,000	5,920
8	15,800	49,600	10,900	18	23,100	27,000	6,580	28	59,800	19,700	5,850
9	19,700	46,900	10,100	19	29,200	24,200	6,870	29	62,000	18,400	6,090
10	20,000	45,200	9,580	20	38,100	22,800	7,360	30	63,000	17,200	6,390
								31	62,200		6,640
Monthly mean discharge, in second-feet									33,210	35,250	8,991
Runoff, in inches									3.98	4.08	1.08

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Gage readings, in feet, with discharge, in second-feet, at various times, 1960												
Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
May 17		May 18		May 19		May 20		May 21		May 22		
4	13.68	19,600	14.68	21,600	17.03	26,900	20.04	34,300	24.51	46,200	27.42	54,500
8	13.71	19,700	14.98	22,200	17.52	28,000	20.58	35,700	25.10	47,900	27.87	55,800
N	13.80	19,800	15.32	22,900	18.00	29,200	21.27	37,500	25.62	49,300	28.32	57,200
4	14.00	20,200	15.70	23,700	18.50	30,400	22.22	40,000	26.05	50,500	28.75	58,400
8	14.20	20,600	16.13	24,700	19.00	31,600	23.12	42,300	26.53	51,900	29.12	59,600
12	14.42	21,000	16.57	25,800	19.52	33,000	23.85	44,400	26.98	53,100	29.46	60,600
May 23		May 24		May 25		May 26		May 27		May 28		
4	29.76	61,500	30.17	62,700	29.67	61,200	28.59	58,000	28.12	56,600	28.96	59,100
8	30.00	62,200	30.10	62,500	29.56	60,900	28.30	57,100	28.27	57,000	29.05	59,400
N	30.12	62,600	30.04	62,300	29.45	60,600	28.05	56,400	28.46	57,600	29.17	59,700
4	30.20	62,800	29.96	62,100	29.33	60,200	27.95	56,000	28.63	58,100	29.29	60,100
8	30.24	62,900	29.88	61,800	29.13	59,600	27.93	56,000	28.76	58,500	29.43	60,500
12	30.22	62,900	29.78	61,500	28.89	58,900	27.99	56,200	28.66	58,800	29.58	60,900
May 29		May 30		May 31		June 1		June 2		June 3		
4	29.72	61,400	30.22	62,900	30.30	63,100	29.00	59,200	27.62	55,100	27.00	53,200
8	29.87	61,800	30.24	62,900	30.23	62,900	28.70	58,300	27.46	54,600	26.97	53,100
N	30.01	62,200	30.27	63,000	30.10	62,500	28.44	57,500	27.32	54,200	26.95	53,200
4	30.09	62,500	30.31	63,100	29.89	61,900	28.21	56,800	27.19	53,800	26.99	53,200
8	30.13	62,600	30.33	63,200	29.60	61,000	27.98	56,100	27.11	53,500	27.08	53,400
12	30.18	62,700	30.35	63,200	29.30	60,100	27.80	55,600	27.05	53,400	27.21	53,800
June 4		June 5		June 6		June 7		June 8		June 9		
4	27.33	54,200	28.58	57,900	28.34	57,200	27.02	53,300	25.97	50,300	25.13	48,000
8	27.45	54,600	28.61	58,000	28.12	56,600	26.85	52,800	25.78	49,800	24.93	47,400
N	27.58	54,900	28.60	58,000	27.91	55,900	26.70	52,400	25.67	49,500	24.64	46,600
4	27.73	55,400	28.59	58,000	27.65	55,200	26.57	52,000	25.59	49,300	24.49	46,200
8	28.05	56,400	28.56	57,900	27.41	54,400	26.42	51,600	25.50	49,000	24.42	46,000
12	28.46	57,600	28.51	57,700	27.18	53,700	26.21	51,000	25.36	48,500	24.37	45,800
June 10		June 11		June 12		June 13		June 14		June 15		
4	24.32	45,700	23.61	43,700	22.27	40,100	21.52	38,200	20.60	35,800	19.62	33,200
8	24.25	45,500	23.44	43,200	21.94	39,200	21.39	37,800	20.45	35,400	19.42	32,700
N	24.16	45,200	23.27	42,800	21.70	38,600	21.23	37,400	20.30	35,000	19.22	32,200
4	24.06	45,000	23.05	42,100	21.62	38,400	21.06	37,000	20.13	34,500	19.00	31,600
8	23.93	44,800	22.83	41,600	21.59	38,300	20.90	36,500	19.97	34,100	18.80	31,100
12	23.77	44,200	22.56	40,900	21.55	38,200	20.75	36,200	19.81	33,700	18.57	30,600
June 16		June 17		June 18		June 19		June 20		June 21		
4	18.39	30,100	17.50	28,000	17.45	27,900	16.25	25,000	15.43	23,100	15.01	22,200
8	18.22	29,700	17.54	28,100	17.36	27,700	16.02	24,400	15.36	23,000	14.93	22,100
N	18.06	29,300	17.62	28,300	17.14	27,100	15.82	24,000	15.28	22,800	14.85	21,900
4	17.90	29,000	17.60	28,200	16.90	26,600	15.70	23,700	15.20	22,600	14.80	21,800
8	17.74	28,600	17.55	28,100	16.70	26,100	15.60	23,500	15.13	22,500	14.77	21,700
12	17.58	28,200	17.50	28,000	16.49	25,600	15.51	23,300	15.07	22,400	14.74	21,700

Clark Fork at St. Regis, Mont.

Location.- Lat. 47°18', long. 115°05', in SW $\frac{1}{4}$  sec. 19, T. 18 N., R. 27 W., at St. Regis, half a mile downstream from St. Regis River. (See pl. 10A.)

Drainage area.- 10,500 square miles.

Gage-height record.- Water-stage recorder graph except for period 8 a.m. May 22 to 10 a.m. May 28 for which a graph was drawn based on fragmentary record and observer's observations.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 67,400 second-feet and extended to peak stage. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 68,900 second-feet noon May 24 (gage height, 19.96 feet, from graph based on gage readings).

1910-23, 1929 to April 1948: Discharge, 62,800 second-feet May 30, 31, 1913 (gage height, 19.1 feet).

Remarks.- Many diversions above station. Some regulation. Rating curve changed at peak stage.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July	
1	18,500	63,700	18,600	11	22,400	47,500	10,100	21	50,600	26,300	8,640	
2	18,600	59,200	17,800	12	21,500	44,200	9,400	22	60,200	25,800	8,540	
3	17,700	58,000	17,600	13	21,500	41,700	9,630	23	65,600	26,800	8,050	
4	16,900	59,700	16,900	14	22,400	38,700	9,240	24	68,100	26,200	7,540	
5	16,500	62,500	15,300	15	23,300	36,100	8,740	25	64,300	25,900	7,260	
6	16,100	60,500	14,300	16	23,800	33,400	8,360	26	61,900	25,200	7,050	
7	17,100	57,100	13,100	17	24,800	32,600	8,070	27	63,200	24,200	6,780	
8	19,600	54,100	12,300	18	27,600	31,400	7,930	28	66,900	22,600	6,670	
9	23,200	51,800	11,500	19	33,100	29,200	7,120	29	68,000	21,100	6,870	
10	23,600	50,300	11,100	20	41,100	27,100	8,510	30	67,600	19,800	7,030	
									31	67,200		7,190
Monthly mean discharge, in second-feet.....									37,180	39,420	10,230	
Runoff, in inches .....									4.08	4.18	1.12	

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	12.06	24,200	12.61	26,600	13.61	31,100	15.01	37,800	16.78	47,600	18.40	57,900
N	12.12	24,400	12.76	27,200	13.84	32,200	15.34	39,500	17.04	49,100	18.64	59,800
8	12.13	24,500	12.89	27,800	14.03	33,000	15.65	41,100	17.28	50,600	18.77	60,500
4	12.16	24,600	13.02	28,400	14.23	34,000	15.94	42,600	17.48	51,800	18.91	61,500
8	12.23	24,900	13.16	29,000	14.44	35,000	16.21	44,200	17.75	53,600	19.04	62,400
12	12.41	25,700	13.37	30,000	14.72	36,400	16.50	45,900	18.07	55,700	19.17	63,300
	May 23		May 24		May 25		May 26		May 27		May 28	
4	19.28	64,100	19.86	68,200	19.52	65,700	19.05	62,400	18.95	61,800	19.69	66,900
N	19.41	65,000	19.92	69,600	19.40	64,900	19.01	62,200	19.02	62,200	19.74	67,300
8	19.52	65,700	19.96	69,900	19.30	64,200	18.97	61,900	19.12	62,900	19.71	67,100
4	19.62	66,400	19.87	69,200	19.20	63,500	18.93	61,600	19.25	63,800	19.66	66,700
8	19.72	67,100	19.75	67,400	19.14	63,100	18.90	61,400	19.42	65,000	19.66	66,700
12	19.79	67,600	19.63	66,500	19.09	62,700	18.90	61,400	19.58	66,200	19.72	67,100
	May 29		May 30		May 31		June 1		June 2		June 3	
4	19.76	67,400	19.86	68,200	19.80	67,700	19.53	65,800	18.82	60,800	18.44	58,200
N	19.81	67,800	19.84	68,000	19.80	67,700	19.39	64,800	18.68	59,900	18.39	57,800
8	19.86	68,200	19.76	67,400	19.75	67,400	19.27	64,000	18.52	58,700	18.34	57,500
4	19.91	68,500	19.72	67,100	19.68	66,900	19.06	62,500	18.41	58,000	18.39	57,800
8	19.88	68,300	19.73	67,200	19.61	66,400	18.93	61,600	18.42	58,000	18.45	58,200
12	19.86	68,200	19.78	67,600	19.59	66,200	18.88	61,300	18.45	58,200	18.53	58,800
	June 4		June 5		June 6		June 7		June 8		June 9	
4	18.54	58,900	19.08	62,700	19.00	62,100	18.49	58,500	18.01	55,300	17.65	52,900
N	18.54	58,900	19.12	62,900	18.88	61,300	18.39	57,800	17.89	54,500	17.54	52,200
8	18.60	59,300	19.09	62,700	18.76	60,400	18.26	56,900	17.79	53,800	17.43	51,500
4	18.70	60,000	19.06	62,500	18.61	59,400	18.13	56,000	17.68	53,100	17.33	50,900
8	18.83	60,900	19.03	62,300	18.55	59,000	18.09	55,800	17.69	53,200	17.32	50,800
12	18.96	61,800	19.03	62,300	18.55	59,000	18.10	55,800	17.70	53,200	17.40	51,300
	June 10		June 11		June 12		June 13		June 14		June 15	
4	17.39	51,200	16.92	48,400	16.41	45,400	15.93	42,600	15.38	39,700	14.88	37,200
N	17.38	51,200	16.85	48,000	16.31	44,800	15.85	42,100	15.28	39,200	14.78	36,700
8	17.25	50,400	16.79	47,600	16.19	44,100	15.78	41,800	15.17	38,600	14.67	36,200
4	17.13	49,700	16.66	46,900	16.10	43,500	15.72	41,400	15.08	38,200	14.54	35,500
8	17.04	49,100	16.61	46,800	16.04	43,200	15.60	40,800	15.01	37,800	14.42	34,900
12	16.98	48,800	16.51	46,000	16.01	43,000	15.47	40,200	14.96	37,600	14.30	34,300
	June 16		June 17		June 18		June 19		June 20		June 21	
4	14.26	34,100	13.97	32,800	13.80	32,000	13.38	30,000	12.80	27,400	12.65	26,700
N	14.16	33,700	13.99	32,900	13.77	31,800	13.31	29,700	12.74	27,100	12.62	26,400
8	14.08	33,300	13.95	32,700	13.70	31,500	13.21	29,200	12.71	27,000	12.58	26,600
4	13.98	32,800	13.89	32,400	13.63	31,200	13.11	28,800	12.70	27,000	12.51	26,100
8	14.03	33,000	13.85	32,200	13.54	30,800	12.99	28,300	12.68	26,900	12.46	25,900
12	14.00	32,900	13.82	32,100	13.44	30,300	12.88	27,800	12.67	26,800	12.41	25,700

## Clark Fork near Plains, Mont.

Location.- Lat. 47°26', long. 114°51', on lot 7, SW $\frac{1}{4}$  sec. 1, T. 19 N., R. 26 W., 2 miles upstream from Plains and 6 miles downstream from Flathead River. Datum of gage is 2,499.34 feet above mean sea level, datum of 1929 (levels by Corps of Engineers). (See pl. 10B.)

Drainage area.- 19,900 square miles.

Gage-height record.- Water-stage recorder graph except parts of July 20-24, for which gage heights were partly estimated.

Discharge record.- Stage-discharge relation defined by current-meter measurements. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 134,000 second-feet 1:30 p.m. June 5 (gage height, 19.17 feet).

1910 to April 1948: Discharge, 126,000 second-feet May 28, 1928 (gage height, 18.4 feet).

Remarks.- Many diversions above station for irrigation. Some regulation by Flathead Lake.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	35,600	132,000	31,400	11	49,600	122,000	18,200	21	87,400	82,300	23,200
2	37,400	129,000	26,000	12	48,900	118,000	21,000	22	100,000	79,900	24,300
3	37,900	129,000	25,100	13	48,700	113,000	24,700	23	109,000	79,500	24,100
4	37,600	131,000	24,900	14	49,600	108,000	24,800	24	114,000	77,700	21,200
5	37,600	135,000	23,800	15	51,000	104,000	24,300	25	117,000	75,000	16,800
6	36,000	132,000	22,900	16	52,200	99,200	20,100	26	118,000	74,200	15,300
7	39,200	130,000	22,000	17	52,900	96,600	16,100	27	122,000	71,500	15,000
8	42,500	128,000	21,300	18	56,300	94,000	16,500	28	127,000	69,400	15,000
9	46,100	125,000	20,600	19	62,900	89,900	16,300	29	130,000	64,500	19,200
10	50,000	124,000	18,200	20	73,800	85,200	17,800	30	132,000	52,600	22,800
								31	133,000		23,800
Monthly mean discharge, in second-feet .....									72,230	101,600	21,180
Runoff, in inches .....									4.18	5.70	1.22

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	11.35	52,600	11.57	54,500	12.19	60,100	13.14	69,300	14.62	84,100	15.78	95,700
8	11.37	52,800	11.67	55,400	12.33	61,400	13.37	71,800	14.80	85,900	16.06	98,700
N	11.38	52,900	11.79	56,500	12.48	62,900	13.60	73,900	14.97	87,800	16.25	101,000
4	11.40	53,000	11.86	57,100	12.61	64,100	13.76	75,500	15.12	89,100	16.37	102,000
8	11.43	53,300	11.95	57,900	12.79	65,800	14.00	77,900	15.28	90,700	16.50	104,000
12	11.50	53,900	12.06	58,900	12.95	67,400	14.36	81,700	15.48	92,700	16.67	105,000
	May 23		May 24		May 25		May 26		May 27		May 28	
4	16.77	106,000	17.39	113,000	17.65	116,000	17.80	118,000	18.08	121,000	18.48	126,000
8	16.90	108,000	17.44	114,000	17.72	117,000	17.85	118,000	18.17	122,000	18.59	127,000
N	16.98	109,000	17.50	114,000	17.76	117,000	17.89	119,000	18.20	122,000	18.65	128,000
4	17.07	110,000	17.55	115,000	17.77	117,000	17.92	119,000	18.24	123,000	18.67	128,000
8	17.20	111,000	17.56	115,000	17.75	117,000	17.92	119,000	18.28	123,000	18.69	128,000
12	17.31	112,000	17.59	115,000	17.75	117,000	17.92	119,000	18.36	124,000	18.72	128,000
	May 29		May 30		May 31		June 1		June 2		June 3	
4	18.76	129,000	19.01	132,000	19.06	133,000	19.06	133,000	18.88	130,000	18.73	129,000
8	18.82	130,000	19.01	132,000	19.07	133,000	19.04	132,000	18.85	130,000	18.75	129,000
N	18.86	130,000	19.03	132,000	19.08	133,000	19.01	132,000	18.83	130,000	18.73	129,000
4	18.91	131,000	19.04	132,000	19.07	133,000	18.97	131,000	18.77	129,000	18.73	129,000
8	18.94	131,000	19.04	132,000	19.06	133,000	18.93	131,000	18.71	128,000	18.76	129,000
12	18.97	131,000	19.05	132,000	19.06	133,000	18.90	131,000	18.72	128,000	18.79	129,000
	June 4		June 5		June 6		June 7		June 8		June 9	
4	18.83	130,000	19.08	133,000	19.11	133,000	18.95	131,000	18.75	128,000	18.59	126,000
8	18.87	130,000	19.13	133,000	19.09	133,000	18.92	131,000	18.71	128,000	18.55	126,000
N	18.90	131,000	19.16	134,000	19.07	133,000	18.89	130,000	18.70	128,000	18.54	126,000
4	18.92	131,000	19.16	134,000	19.05	132,000	18.85	130,000	18.65	127,000	18.48	125,000
8	18.97	131,000	19.15	134,000	18.99	131,000	18.90	129,000	18.61	127,000	18.43	124,000
12	19.03	132,000	19.13	133,000	18.96	131,000	18.78	129,000	18.50	126,000	18.46	125,000
	June 10		June 11		June 12		June 13		June 14		June 15	
4	18.45	124,000	18.27	122,000	17.97	118,000	17.64	114,000	17.22	109,000	16.85	105,000
8	18.40	124,000	18.20	121,000	17.84	117,000	17.52	113,000	17.09	108,000	16.73	103,000
N	18.32	123,000	18.09	120,000	17.72	115,000	17.39	111,000	16.96	106,000	16.55	101,000
4												
8												
12												
	June 16		June 17		June 18		June 19		June 20		June 21	
4	16.43	99,900	16.15	96,800	15.96	94,800	15.59	90,700	15.15	85,800	14.88	82,900
8	16.30	98,500	16.12	96,500	15.85	93,600	15.47	89,400	15.02	84,400	14.78	81,900
N												
4												
8												
12	16.20	97,400	16.03	95,500	15.71	92,000	15.29	87,400	14.93	83,400	14.69	81,000

Supplemental record.- June 5, 1:30 p.m., 19.17 ft., 134,000 sec.-ft.



**A. U. S. HIGHWAY 10 NEAR SUPERIOR.**  
Courtesy of H. H. Kuphal, Montana State Highway Department.



**B. U. S. HIGHWAY 10A AT PERMA.**  
Courtesy of H. H. Kuphal, Montana State Highway Department.

**FLOOD SCENES ON CLARK FORK IN MONTANA.**



## Clark Fork near Heron, Mont.

Location.- Lat. 48°04', long. 115°59', in sec. 28, T. 27 N., R. 34 W., 600 feet upstream from Dead Horse Creek and 1½ miles northwest of Heron.

Drainage area.- 21,800 square miles.

Gage-height record.- Water-stage recorder graph except for period 8 a.m. June 8 to 7 p.m. June 14, when there was no gage-height record.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Shifting-control method used June 14 to July 31. Discharge for period of no gage-height record computed on basis of records for station at St. Regis and Flathead River near Polson.

Maxima.- May-June 1948: Discharge, 153,000 second-feet 4 p.m. May 29 to noon June 1; gage height, 50.97 feet 1 a.m. May 31.

1928 to April 1948: Discharge, 137,000 second-feet June 17, 1933 (gage height, 46.62 feet, present datum).

Discharge known, 195,000 second-feet June 1894 (gage height, 59.1 feet, present datum, from floodmark an eighth of a mile downstream).

Remarks.- Some regulation by Flathead Lake. Diversions from tributaries above station for irrigation.

Mean discharge, in second-feet, 1948

mean discharge, in second-feet, 1940											
Day	May	June	July	Day	May	June	July	Day	May	June	July
1	42,600	152,000	51,300	11	58,400	137,000	21,400	21	98,900	93,600	20,800
2	44,600	150,000	34,800	12	57,700	134,000	21,100	22	114,000	90,200	25,700
3	45,200	147,000	31,300	13	58,100	129,000	24,900	23	126,000	88,000	26,200
4	45,500	148,000	30,100	14	59,500	124,000	27,200	24	132,000	87,000	25,600
5	44,900	150,000	29,100	15	60,000	118,000	27,100	25	138,000	84,900	21,800
6	45,200	151,000	27,700	16	61,100	114,000	26,300	26	140,000	82,700	18,300
7	46,900	149,000	26,700	17	62,800	110,000	21,800	27	144,000	80,200	17,200
8	50,800	146,000	25,600	18	66,400	107,000	18,500	28	148,000	76,800	17,000
9	54,900	142,000	24,700	19	72,200	103,000	19,000	29	152,000	73,200	17,100
10	58,300	139,000	23,800	20	83,300	98,100	18,700	30	153,000	68,000	22,200
								31	153,000		25,000
Monthly mean discharge, in second-feet .....									84,420	115,800	24,770
Runoff, in inches .....									4.46	5.92	1.31

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	29.35	61,900					33.47	78,300				
8	29.39	62,100	30.28	65,500	31.65	71,000	34.07	80,700	37.91	96,500	41.44	112,000
N	29.54	62,600			31.86	71,800						
4	29.72	63,300	30.71	67,200	32.16	73,000	35.27	85,600	39.08	101,000	42.65	117,000
8							35.98	88,500				
12	29.97	64,300	31.16	69,000	33.00	76,400	36.62	91,200	40.28	107,000	43.69	121,000
	May 23		May 24		May 25		May 26		May 27		May 28	
4	44.70	126,000	46.14	132,000	47.20	137,000	47.98	140,000				
8							48.04	140,000	48.68	143,000	49.72	148,000
N	45.36	128,000	46.46	133,000	47.46	138,000	48.10	140,000			50.05	149,000
4					47.71	139,000			49.27	146,000	50.37	151,000
8	45.76	130,000	46.82	135,000	47.87	140,000	48.36	142,000				
	May 29		May 30		May 31		June 1		June 2		June 3	
4	50.60	152,000					50.85	153,000				
8							50.85	153,000	50.44	151,000	49.60	147,000
N	50.80	153,000	50.90	153,000	50.85	153,000	50.78	152,000				
4									50.10	149,000	49.42	146,000
8	50.85	153,000	50.96	153,000	50.83	153,000	50.68	152,000	49.85	148,000	49.50	147,000
	June 4		June 5		June 6		June 7		June 8		June 9	
4	49.52	147,000	50.09	149,000	50.60	152,000			49.40	146,000		
8							50.00	149,000				
N	49.72	148,000	50.30	150,000	50.54	151,000						
4												
8	49.88	148,000	50.55	151,000	50.40	151,000	49.70	148,000				
	June 10		June 11		June 12		June 13		June 14		June 15	
4												
8											43.01	118,000
N											42.87	118,000
4									43.92	122,000		
8									43.73	121,000	42.53	116,000
12												
	June 16		June 17		June 18		June 19		June 20		June 21	
4	42.14	114,000	41.19	110,000	40.72	108,000	39.98	105,000				
8					40.61	108,000	39.69	104,000	38.58	98,900	37.45	94,200
N					40.46	107,000					37.34	93,700
4	41.75	113,000	40.96	109,000			39.31	102,000	38.19	97,300	37.19	93,100
8					40.21	106,000					37.01	92,300
12	41.48	112,000	40.82	109,000	40.16	106,000	38.96	101,000	37.74	95,400	36.96	92,100

## Pend Oreille Lake at Hope, Idaho

Location.- Lat. 48°15', long. 116°18', in lot 2, sec. 35, T. 57 N., R. 1 E., at floating dock near Northern Pacific Railway station at Hope. Datum of gage is 2,000.00 feet above mean sea level, datum of 1929.

Drainage area.- 22,900 square miles.

Gage-height record.- Water-stage recorder graph.

Maxima.- May-June 1948: Gage height, 71.82 feet 6 to 9 p.m. June 9.

1921 to April 1948: Gage height, 68.78 feet June 21, 1933. Stage known, 76.08

Stage known, 76.08 feet June 1894.

Remarks.- Diversions from tributaries of Clark Fork for irrigation. Since 1938 inflow affected by Flathead Lake.

Mean gage height, in feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	54.62	70.21	63.25	11	56.95	71.68	55.75	21	60.25	68.18	52.84
2	54.83	70.60	62.30	12	57.22	71.60	55.26	22	61.21	67.66	52.72
3	55.03	70.92	61.28	13	57.51	71.38	54.84	23	62.38	67.13	52.70
4	55.23	71.15	60.30	14	57.77	71.11	54.56	24	63.66	66.62	52.64
5	55.41	71.35	59.50	15	58.02	70.77	54.34	25	64.73	66.16	52.52
6	55.57	71.55	58.75	16	58.22	70.42	54.13	26	65.72	65.72	52.34
7	55.75	71.71	58.07	17	58.45	70.03	53.89	27	66.65	65.28	52.16
8	56.01	71.77	57.41	18	58.69	69.60	53.59	28	67.52	64.82	51.99
9	56.29	71.80	56.81	19	58.99	69.15	53.31	29	68.40	64.35	51.80
10	56.62	71.79	56.26	20	59.48	68.70	53.12	30	69.11	63.90	51.71
								31	69.71		

Pend Oreille River below Z Canyon, near Metaline Falls, Wash.  
(International gaging station)

Location.— Lat. 48°59', long. 117°21', in lot 2, sec. 11, T. 40 N., R. 43 E., three-quarters of a mile downstream from Z Canyon, 1½ miles south of international boundary, 5 miles downstream from Slate Creek, and 10 miles downstream from Metaline Falls. Datum of gage is 1,721.80 feet above mean sea level, datum of 1929 (levels by Corps of Engineers).

Drainage area.— 25,200 square miles; 22,900 square miles affected by natural storage in Pend Oreille Lake.

Gage-height record.— Water-stage recorder graph except for period noon June 16 to July 6.

Discharge record.— Stage-discharge relation defined by current-meter measurements. Discharge for period of no gage-height record was computed on basis of staff-gage readings for Pend Oreille River at Priest River, Idaho, furnished by Corps of Engineers. Gage heights used to hundredths.

Maxima.— May-June 1948: Discharge, 171,300 second-feet 3:30 p.m. June 13 (gage height, 60.25 feet).

1912 to April 1948: Discharge, 139,000 second-feet June 16, 1913 (gage height, 41.2 feet, site and datum then in use).

Remarks.— Some regulation by Flathead Lake. Many small diversions from upper tributaries for irrigation.

This is one of the international gaging stations maintained by the United States under agreement with Canada. Records provisional, subject to revision.

*Mean discharge, in second-feet, 1948*

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	44,700	145,400	103,000	11	59,100	169,200	58,500	21	78,400	151,000	37,600
2	45,400	149,700	99,000	12	61,003	171,000	54,800	22	82,300	146,000	36,400
3	46,600	153,400	94,000	13	63,600	171,100	51,500	23	88,400	141,000	35,500
4	48,800	152,100	89,000	14	65,300	170,600	48,900	24	95,500	137,000	34,500
5	49,900	153,200	85,000	15	66,500	169,300	46,700	25	102,700	132,000	33,900
6	51,200	154,100	80,000	16	68,300	168,000	45,300	26	110,000	127,000	33,500
7	52,800	156,300	74,200	17	69,800	168,000	43,600	27	116,900	122,000	32,800
8	54,000	160,100	70,500	18	70,800	164,000	42,200	28	123,100	117,000	32,000
9	56,000	163,600	66,000	19	72,500	160,000	40,600	29	127,400	113,000	31,200
10	57,600	166,600	62,100	20	75,400	156,000	39,000	30	132,900	108,000	30,200
								31	139,700		29,500
Monthly mean discharge, in second-feet.....									76,660	150,500	53,580
Runoff, in inches.....									3.51	6.66	2.45

*Gage height, in feet, and discharge, in second-feet, at indicated time, 1948*

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	31.17	69,500	31.50	70,500	31.91	71,700	32.83	74,500	33.80	77,500	34.84	80,700
8	31.24	69,700	31.54	70,600	32.01	72,000	32.96	74,900	33.90	77,800	35.05	81,300
N	31.29	69,800	31.62	70,800	32.14	72,400	33.07	75,300	34.03	78,200	35.30	82,100
4	31.34	70,000	31.67	71,000	32.25	72,800	33.22	75,700	34.20	78,700	35.61	83,000
8	31.42	70,200	31.73	71,200	32.44	73,300	33.42	76,300	34.50	79,600	35.94	84,000
12	31.45	70,300	31.82	71,500	32.64	74,000	33.70	77,200	34.70	80,200	36.23	84,900
	May 23		May 24		May 25		May 26		May 27		May 28	
4	36.60	86,000	38.95	93,200	41.23	100,200	43.70	107,700	45.97	114,600	48.14	121,200
8	36.97	87,200	39.32	94,300	41.61	101,300	44.06	108,800	46.30	115,600	48.46	122,200
N	37.37	88,400	39.69	95,500	42.00	102,500	44.42	109,900	46.67	116,700	48.72	123,000
4	37.81	89,700	40.08	96,600	42.47	103,900	44.81	111,100	47.09	118,000	49.06	124,000
8	38.19	90,900	40.50	97,900	42.93	105,300	45.23	112,400	47.54	119,400	49.38	125,000
12	38.53	91,900	40.86	99,000	43.35	106,600	45.65	113,600	47.88	120,400	49.58	125,600
	May 29		May 30		May 31		June 1		June 2		June 3	
4	49.74	126,100	51.22	130,800	53.10	137,700	54.59	143,700	55.61	148,200	56.64	153,000
8	49.89	126,600	51.51	131,800	53.35	138,700	54.81	144,700	55.73	148,800	56.78	153,700
N	50.09	127,200	51.81	132,900	53.60	139,700	55.00	145,500	55.92	149,600	56.88	154,200
4	50.35	128,000	52.09	133,900	53.87	140,800	55.19	146,400	56.09	150,400	56.80	153,800
8	50.60	128,800	52.41	135,100	54.11	141,800	55.34	147,000	56.30	151,400	56.67	153,200
12	50.91	129,800	52.70	136,200	54.38	142,900	55.50	147,700	56.47	152,200	56.80	152,400
	June 4		June 5		June 6		June 7		June 8		June 9	
4	56.40	151,900	56.62	152,900	56.77	153,700	57.10	155,300	57.80	158,800	58.53	162,500
8	56.36	151,700	56.66	153,100	56.76	153,600	57.20	155,800	57.92	159,400	58.63	163,000
N	56.43	152,000	56.70	153,300	56.84	154,000	57.28	156,200	58.06	160,100	58.80	163,900
4	56.47	152,200	56.72	153,400	56.91	154,300	57.41	156,800	58.20	160,800	58.85	164,100
8	56.51	152,400	56.72	153,400	56.98	154,700	57.54	157,500	58.35	161,600	58.95	164,600
12	56.56	152,600	56.74	153,500	57.01	154,800	57.67	158,100	58.48	162,200	59.10	165,400
	June 10		June 11		June 12		June 13		June 14		June 15	
4	59.20	165,900	59.64	168,200	60.11	170,600	60.20	171,100	60.19	171,000	59.95	169,800
8	59.30	166,400	59.75	168,700	60.20	171,100	60.15	170,800	60.16	170,900	59.90	169,500
N	59.36	166,700	59.85	169,300	60.20	171,100	60.20	171,100	60.10	170,600	59.85	169,300
4	59.40	166,900	59.99	170,000	60.20	171,100	60.22	171,200	60.05	170,300	59.85	169,300
8	59.47	167,300	60.04	170,200	60.20	171,100	60.20	171,100	60.00	170,000	59.81	169,100
12	59.54	167,600	60.09	170,500	60.20	171,100	60.20	171,100	60.00	170,000	59.70	168,500
	June 16		June 17		June 18		June 19		June 20		June 21	
4	59.64	168,200										
8	59.61	168,000										
N	59.60	168,000										
4												
8												
12												

Supplemental record.— June 13, 3:30 p.m., 60.25 ft., 171,300 sec.-ft.



Smaller reservoirs in Pend Oreille River Basin, Mont.

Georgetown Lake near Southern Cross, Mont.

Location.- Lat. 46°13', long. 113°16'40", in SW $\frac{1}{4}$  sec. 6, T. 5 N., R. 13 W., on Flint Creek at outlet of dam, 2 miles west of Southern Cross, and 8 miles south of Philipsburg. Datum of gage is at mean sea level (levels by Montana Power Co.).

Drainage area.- 50.6 square miles.

Gage-height record.- Staff gage read to hundredths daily at 8 a.m.

Maxima.- May-June 1948: Contents, 28,510 acre-feet June 23, 24 (elevation, 6,428.65 feet).

1939 to April 1948: Contents, 29,520 acre-feet Dec. 2, 3, 1943 (elevation, 6,428.99 feet, lake ice covered).

Remarks.- Storage capacity, 31,040 acre-feet. Records furnished by Montana Power Co.

Elevation, in feet, and contents, in acre-feet, 1948

Day	May		June		July	
	Elevation	Contents	Elevation	Contents	Elevation	Contents
1	25.98	20,970	28.02	26,640	28.50	28,070
2	25.97	20,940	28.09	26,850	28.50	28,070
3	25.95	20,890	28.16	27,060	28.48	28,010
4	25.96	20,910	28.28	27,410	28.46	27,950
5	25.96	20,910	28.35	27,620	28.43	27,860
6	25.98	20,970	28.41	27,800	28.38	27,710
7	26.02	21,080	28.44	27,890	28.33	27,560
8	26.12	21,360	28.46	27,950	28.33	27,560
9	26.22	21,640	28.49	28,040	28.34	27,590
10	26.25	21,720	28.50	28,070	28.38	27,710
11	26.28	21,800	28.51	28,100	28.42	27,830
12	26.31	21,890	28.56	28,240	28.49	28,040
13	26.35	22,000	28.58	28,300	28.53	28,160
14	26.40	22,140	28.58	28,300	28.55	28,220
15	26.45	22,270	28.57	28,270	28.57	28,270
16	26.49	22,390	28.55	28,220	28.59	28,330
17	26.52	22,470	28.58	28,300	28.58	28,300
18	26.56	22,580	28.56	28,240	28.58	28,300
19	26.65	22,830	28.55	28,220	28.60	28,360
20	26.78	23,190	28.52	28,130	28.62	28,420
21	26.88	23,470	28.52	28,130	28.64	28,480
22	26.99	23,770	28.61	28,390	28.63	28,450
23	27.10	24,080	28.65	28,510	28.62	28,420
24	27.22	24,410	28.65	28,510	28.61	28,390
25	27.33	24,720	28.64	28,480	28.59	28,330
26	27.43	25,000	28.63	28,450	28.57	28,270
27	27.55	25,330	28.62	28,420	28.55	28,220
28	27.67	25,660	28.59	28,330	28.56	28,240
29	27.76	25,910	28.55	28,220	28.55	28,220
30	27.89	26,270	28.51	28,100	28.54	28,190
31	27.96	26,470			28.52	28,130

Note.- Add 6,400 feet to obtain elevation above mean sea level.

East Fork Rock Creek Reservoir near Philipsburg, Mont.

Location.- Lat. 46°08', long. 113°23', in NE $\frac{1}{4}$  sec. 6, T. 4 N., R. 14 W., on East Fork Rock Creek, 14 miles southwest of Philipsburg.

Drainage area.- 32 square miles.

Remarks.- Records furnished by Montana State Water Conservation Board. Dam completed in 1938 for irrigation in Flint Creek Valley and has a usable capacity of 16,000 acre-feet at spillway crest; elevation, 6,055.5 feet. Contents reported as follows:

Contents, in acre-feet, 1948

May 1	12,400	July 1	16,000
15	12,700	15	16,000
June 1	16,000	Aug. 1	16,000
15	16,000		

## Smaller reservoirs in Pend Oreille River Basin, Mont.--Continued

## Nevada Creek Reservoir near Finn, Mont.

Location.-- Lat. 46°48', long. 112°49', in NE¼ sec. 14, T. 12 N., R. 10 W., on Nevada Creek, 7 miles west of Finn.

Drainage area.-- 145 square miles.

Remarks.-- Records furnished by Montana State Water Conservation Board. Spillway elevation, 4,616.0 feet with usable capacity of 12,600 acre-feet. Only record available shows reservoir full and spilling on May 1, 1948, and until Sept. 4, 1948. Dam completed in 1938 for irrigation.

## West Fork Bitterroot River Reservoir near Conner, Mont.

Location.-- Lat. 45°43', long. 114°17', in SW¼ sec. 26, T. 1 S., R. 22 W., on West Fork Bitterroot River, 7 miles upstream from Nez Perce Creek and 23 miles south of Darby.

Drainage area.-- 572 square miles.

Remarks.-- Records furnished by Montana State Water Conservation Board. Dam completed in 1940 for irrigation in Bitterroot Valley and has a usable capacity of 31,600 acre-feet at spillway crest; elevation, 4,450 feet. Contents reported as follows:

## Contents, in acre-feet, 1948

May 1	22,000	May 15	32,000
8	26,500	Sept. 12	32,000

## Como Lake near Darby, Mont.

Location.-- Lat. 46°08', long. 114°15', in sec. 32, T. 4 N., R. 21 W., 1½ mile upstream from gaging station on Rock Creek near Darby and 4 miles northwest of Darby. Datum of gage is 4,188.5 feet above mean sea level (U. S. Coast and Geodetic Survey datum).

Drainage area.-- 54 square miles.

Gage-height record.-- Staff gage read occasionally.

Remarks.-- Maximum capacity at 54.0 feet gage height (elevation, 4,242.5 feet), 34,800 acre-feet. Records furnished by Bitterroot Irrigation District. Dam at Como Lake was completed in 1909. No record of maximum contents available. Records since 1940 indicate that it has been filled to capacity at times during nearly every year.

## Gage height, in feet, and contents, in acre-feet, 1948

Day	April		May		June		July		August	
	Gage height	Contents	Gage height	Contents	Gage height	Contents	Gage height	Contents	Gage height	Contents
1					51.00	32,100	54.00	34,800	47.67	29,100
3					51.00	32,100	54.00	34,800		
6					50.50	31,600	54.00	34,800		
9			41.00	23,400	51.00	32,100	54.00	34,800		
12			41.50	23,800	52.00	33,000	54.00	34,800		
15			42.00	24,200	52.50	33,400	54.00	34,800		
17							54.00	34,800		
18			43.00	25,100	53.00	33,900	54.00	34,800		
21			44.50	26,400	53.00	33,900	53.67	34,500		
23							53.00	33,900		
24			46.33	28,000	54.00	34,800				
27			49.00	30,300	54.00	34,800	51.25	32,300		
30	38.58	21,300			54.00	34,800	49.50	30,800		
31			51.00	32,100			48.83	30,200		

## Smaller reservoirs in Pend Oreille River Basin, Mont.--Continued

## Camas Reservoirs

A group of four reservoirs in Little Bitterroot River Basin operated for irrigation. Records furnished by Office of Indian Affairs. All gages set to sea level datum. No recording gages. Complete record of month-end contents available since Sept. 30, 1940.

Little Bitterroot Lake on Little Bitterroot River, diversion works in sec. 21, T. 27 N., R. 24 W., 2 miles southwest of Marion; completed in 1918, has usable capacity of 18,000 acre-feet at elevation 3,895.4 feet.  
Maximum contents observed: May-July 1948, 24,000 acre-feet May 25 to July 31.  
1940 to Apr. 30, 1948: 12,300 acre-feet June 30, 1947.

Hubbart Reservoir on Little Bitterroot River, diversion works in sec. 18, T. 25 N., R. 24 W., 9 miles northwest of Niarada; completed in 1923, has usable capacity of 12,100 acre-feet at spillway crest elevation 3,219.0 feet.  
Maximum contents observed: May-July 1948, 12,100 acre-feet Apr. 30 to July 31.  
1940 to Apr. 30, 1948: 12,100 acre-feet, May 31, June 30, 1943.

Upper Dry Fork Reservoir on Dry Fork Creek, diversion works in sec. 16, T. 23 N., R. 24 W., 4 miles northwest of Lonepine; completed in 1940, has usable capacity of 2,700 acre-feet at elevation 2,928.1 feet.  
Maximum contents observed: May-June 1948, 2,660 acre-feet June 30.  
1940 to April 30, 1948: 2,510 acre-feet June 30, 1947.

Dry Fork Reservoir on Dry Fork Creek, diversion works in sec. 3, T. 22 N., R. 24 W., 1 mile west of Lonepine; completed in 1934, has usable capacity of 4,000 acre-feet at elevation 2,856.7 feet.  
Maximum contents observed: May-June 1948, 3,750 acre-feet June 22, 30.  
1940 to Apr. 30, 1948: 4,080 acre-feet, Apr. 30, 1942.

Contents, in acre-feet, on indicated date, 1948

Date	Little Bitterroot Lake	Hubbart Reservoir	Upper Dry Fork Reservoir	Dry Fork Reservoir	Total
Apr. 30.....	13,400	12,120	2,070	3,490	31,080
May 4.....	18,600	12,120	2,310	3,470	36,500
18.....	-	12,120	2,440	3,470	-
25.....	24,000	12,120	2,440	3,470	42,030
31.....	24,000	12,120	2,400	3,550	42,070
June 1.....	24,000	12,120	2,400	3,550	42,070
8.....	24,000	12,000	2,460	3,550	42,130
15.....	24,000	12,120	2,480	3,620	42,220
22.....	24,000	12,120	2,510	3,750	42,380
30.....	24,000	12,120	2,660	3,750	42,530
July 6.....	24,000	12,120	2,540	3,660	42,320
13.....	24,000	12,120	2,380	3,590	42,090
20.....	24,000	12,120	2,120	3,510	41,750
27.....	24,000	12,120	1,810	3,240	41,170
31.....	24,000	12,120	1,450	2,940	40,510

## Mission Valley Reservoirs

A group of eight reservoirs in area east of and tributary to Flathead River and Jocko River operated for irrigation. Records furnished by Office of Indian Affairs. All gages set to sea level datum. No recording gages. Complete record of month-end contents available since Sept. 30, 1940.

Twin Reservoir, fed entirely by canals, diversion works in sec. 18, T. 22 N., R. 19 W., 4 miles southeast of Polson, completed in 1932, has usable capacity of 1,210 acre-feet (revised) at elevation 3,095 feet.  
Maximum contents observed, May-June 1948: 687 acre-feet June 1, 8.  
1940 to April 1948: 800 acre-feet June 30, 1947.

Pablo Reservoir, fed entirely by canals, diversion works in sec. 27, T. 22 N., R. 20 W., 3 miles south of Polson; completed in 1914, has usable capacity of 25,000 acre-feet at elevation 3,211.3 feet.  
Maximum contents observed, May-June 1948: 25,170 acre-feet June 1, 4.  
1940 to April 1948: 22,530 acre-feet June 30, 1942.

## Smaller reservoirs in Pend Oreille River Basin, Mont.--Continued

## Mission Valley Reservoirs--Continued

Lower Crow Reservoir, on Crow Creek, diversion works in sec. 11, T. 20 N., R. 21 W., 6 miles west of Ronan, completed in 1933, has usable capacity of 10,350 acre-feet at elevation 2,877 feet.

Maximum contents observed, May-June 1948: 10,770 acre-feet May 21, 22.  
1940 to April 1948: 10,460 acre-feet May 31, 1942, June 30, 1947.

Kicking Horse Reservoir, fed entirely by canals, diversion works in sec. 31, T. 20 N., R. 19 W., 5 miles south of Ronan, completed in 1930, has usable capacity of 8,350 acre-feet at elevation 3,061.94 feet.

Maximum contents observed, May-June 1948: 8,080 acre-feet May 22.  
1940 to April 1948: 8,000 acre-feet June 30, 1943, June 30, 1947.

Ninepipe Reservoir, fed entirely by canals, diversion works in sec. 27, T. 20 N., R. 20 W., 2 miles northwest of Charlo, completed in 1923, has usable capacity of 14,870 acre-feet at elevation 3,010 feet.

Maximum contents observed, May-June 1948: 15,540 acre-feet June 8, 13, 14.  
1940 to April 1948: 15,370 acre-feet June 30, 1942.

McDonald Reservoir, on Post Creek, diversion works in sec. 10, T. 19 N., R. 19 W., 9 miles east of Charlo, completed in 1919, has usable capacity of 8,220 acre-feet at elevation 3,598 feet.

Maximum contents observed, May-June 1948: 8,160 acre-feet May 28, June 11.  
1940 to April 1948: 8,160 acre-feet June 30, 1942.

Mission Reservoir, on Mission Creek, diversion works in sec. 16, T. 18 N., R. 19 W., 4 miles east of St. Ignatius, completed in 1935, has usable capacity of 7,250 acre-feet at elevation 3,406 feet.

Maximum contents observed, May-June 1948: 7,720 acre-feet May 29, June 11.  
1940 to April 1948: 7,450 acre-feet June 30, 1942.

Tabor Reservoir, on Dry Creek, diversion works in sec. 6, T. 17 N., R. 18 W., 8 miles southeast of St. Ignatius, completed in 1919, has usable capacity of 23,000 acre-feet at elevation 4,024 feet.

Maximum contents observed: May-July 1948: 23,310 acre-feet July 8.  
1940 to April 1948: 22,690 acre-feet June 30, 1942.

## Contents, in acre-feet, on indicated dates, 1948

Date	Twin Reservoir	Pablo Reservoir	Lower Crow Reservoir	Kicking Horse Reservoir	Ninepipe Reservoir
Apr. 30.....	238	15,670	9,510	7,840	12,250
May 31.....	600	24,000	10,630	7,840	15,370
June 30.....	633	22,060	10,490	7,430	15,210
July 31.....	452	17,680	8,610	6,520	10,400

Date	McDonald Reservoir	Mission Reservoir	Tabor Reservoir		Total
Apr. 30.....	6,420	2,740	6,050		60,718
May 31.....	8,120	7,690	15,700		89,950
June 30.....	8,080	7,420	21,460		92,783
July 31.....	8,040	6,860	20,640		79,222

## Lower Jocko Lake near Arlee, Mont.

Lower Jocko Lake on Jocko River, diversion works in sec. 28, T. 17 N., R. 17 W., 15 miles east of Arlee, completed in 1937, has usable capacity of 7,600 acre-feet at elevation 4,350 feet. Records furnished by Office of Indian Affairs. Gage set to sea level datum. Nonrecording. Complete record of month-end contents available since Sept. 30, 1940.

Maximum contents observed: May-June 1948, 6,700 acre-feet June 8.

1940 to April 1948: 5,760 acre-feet, June 30, 1943.

Contents reported as follows:

## Contents, in acre-feet, 1948

May 12	1,670	July 12	4,500
31	6,150	23	4,030
June 8	6,700	31	3,640
30	5,240		

## Flint Creek near Southern Cross, Mont.

Location.- Lat.  $46^{\circ}14'$ , long.  $113^{\circ}18'$ , in NW $\frac{1}{4}$  sec. 36, T. 6 N., R. 14 W., half a mile downstream from power plant, 2 miles downstream from Georgetown Lake, 3 miles northwest of Southern Cross, and 6 miles south of Philipsburg.

Drainage area.- 52.5 square miles.

Gage-height record.- Staff gage read once daily.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Gage heights used to hundredths. Shifting-control method used May 1 to June 2, July 7-31. Gate-operation records used to determine mean daily discharge on days when gate had been closed or opened.

Maxima.- May-July 1948: Discharge, 146 second-feet (regulated) June 4 to July 6 (gage height, 1.78 feet).

1940 to April 1948: Discharge observed, 162 second-feet June 13, 1942 (gage height, 1.86 feet).

Remarks.- Flow regulated by Georgetown Lake (see preceding page). Gage height and gate-operation record furnished by Montana Power Co.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	87	93	146	11	40	146	31	21	47	146	71
2	87	104	146	12	40	146	39	22	47	146	71
3	84	117	146	13	40	146	45	23	44	146	71
4	84	137	146	14	40	146	45	24	40	146	71
5	63	146	146	15	40	146	45	25	40	146	71
6	38	146	137	16	40	146	51	26	39	146	71
7	37	146	100	17	42	146	56	27	39	146	70
8	40	146	66	18	42	146	59	28	53	146	70
9	40	146	48	19	44	146	70	29	69	146	70
10	40	146	31	20	45	146	71	30	74	146	70
								31	82		59
Monthly mean discharge, in second-feet.....									51.2	142	77.1
Runoff, in inches.....									1.12	3.01	1.70

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 17			May 26			June 4			June 13	
10a	0.98	42	10:30a	0.93	39	11:30a	1.78	146	11:30a	1.78	146
	May 18			May 27			June 5			June 14	
	.98	42	10a	.93	39	11a	1.78	146	10a	1.78	146
	May 19			May 28			June 6			June 15	
10a	1.00	44	1p	.93	39	2p	1.78	146	10:30a	1.78	146
	May 20			May 29			June 7			June 16	
11a	1.02	45	10a	1.22	64	10a	1.78	146	1p	1.78	146
	May 21			May 30			June 8			June 17	
10a	1.04	47	2p	1.30	74	10:30a	1.78	146	11a	1.78	146
	May 22			May 31			June 9			June 18	
11a	1.04	47	11:30a	1.40	87	12:30p	1.78	146	N	1.78	146
	May 23			June 1			June 10			June 19	
11a	1.00	44	3p	1.44	93	11a	1.78	146	10:30a	1.78	146
	May 24			June 2			June 11			June 20	
10a	.95	40	3:30p	1.60	110	10:30a	1.78	146	1p	1.78	146
	May 25			June 3			June 12			June 21	
10a	.94	40	4p	1.66	121	10a	1.78	146	10:30a	1.78	146

Flint Creek at Maxville, Mont.

Location.- Lat. 46°28'00", long. 113°14'30", in NW¼ sec. 9, T. 8 N., R. 13 W., 0.4 mile west of Maxville and 1 mile upstream from Boulder Creek.

Drainage area.- 208 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 570 second-feet and extended to peak stage by logarithmic plotting. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 928 second-feet 2 p.m. June 4 (gage height, 5.25 feet).

1941 to April 1948: Discharge, 1,680 second-feet Mar. 28, 1943 (gage height, 6.79 feet).

Remarks.- Flow regulated by Georgetown Lake and during irrigation season flow is supplemented by water from East Fork Rock Creek which is diverted in sec. 5, T. 4 N., R. 14 W., 500 feet below Rock Creek Dam, through a canal into Trout Creek, thence into Flint Creek.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	277	307	355	11	242	368	152	21	411	385	192
2	233	349	442	12	221	520	158	22	404	808	181
3	214	379	374	13	213	402	147	23	413	735	179
4	208	764	333	14	228	363	144	24	346	668	179
5	195	721	306	15	218	316	132	25	315	598	168
6	175	515	282	16	206	305	141	26	333	547	162
7	198	464	248	17	221	359	142	27	314	463	159
8	328	434	216	18	280	354	150	28	308	412	162
9	313	395	181	19	310	325	187	29	347	369	172
10	260	351	154	20	381	337	213	30	341	335	171
								31	312		158
Monthly mean discharge, in second-feet									283	455	204
Runoff, in inches									-	-	-

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	3.19	206	3.37	237	3.62	288	3.86	346	4.07	408	3.99	383
8	3.26	218	3.61	286	3.68	302	3.91	360	4.04	399	3.98	380
N	3.31	226	3.68	302	3.71	308	3.93	366	4.05	402	4.00	386
4	3.33	229	3.69	304	3.78	325	4.12	425	4.10	418	4.10	418
8	3.32	228	3.65	295	3.78	325	4.11	421	4.13	428	4.17	442
12	3.32	228	3.61	286	3.81	333	4.14	432	4.02	392	4.16	438
	May 23		May 24		May 25		May 26		May 27		May 28	
4	4.17	442	3.94	369	3.64	293	3.71	308	3.79	328	3.54	271
8	4.09	415	3.88	352	3.67	299	3.75	318	3.72	311	3.60	284
N	4.04	399	3.83	338	3.73	313	3.81	333	3.71	308	3.69	304
4	4.07	408	3.83	338	3.79	328	3.87	349	3.72	311	3.78	325
8	4.05	402	3.81	333	3.83	338	3.89	354	3.70	306	3.84	341
12	4.00	386	3.71	308	3.78	325	3.88	352	3.62	288	3.84	341
	May 29		May 30		May 31		June 1		June 2		June 3	
4	3.82	335	3.90	357	3.72	311	3.60	284	3.80	330	3.94	369
8	3.82	335	3.82	335	3.67	299	3.62	288	3.77	323	3.88	352
N	3.84	341	3.81	333	3.70	306	3.68	302	3.83	358	3.90	357
4	3.89	354	3.82	335	3.75	318	3.75	318	3.92	363	3.97	377
8	3.93	366	3.83	338	3.77	323	3.81	333	3.98	380	4.06	405
12	3.93	366	3.80	330	3.68	302	3.82	335	3.99	383	4.19	449
	June 4		June 5		June 6		June 7		June 8		June 9	
4	4.33	499	4.98	780	4.44	539	4.21	456	4.14	432	4.08	412
8	4.98	780	4.94	760	4.34	502	4.12	425	4.03	396	3.97	377
N	5.23	916	4.88	730	4.28	481	4.12	425	4.03	396	3.98	380
4	5.21	906	4.82	700	4.34	502	4.29	484	4.15	435	4.02	392
8	5.10	845	4.71	650	4.38	517	4.36	510	4.26	474	4.01	389
12	5.04	812	4.59	598	4.32	495	4.27	477	4.23	463	3.95	372
	June 10		June 11		June 12		June 13		June 14		June 15	
4	3.87	349	3.82	335	4.17	442	4.17	442	3.97	377	3.75	318
8	3.83	338	3.84	341	4.28	481	4.04	399	3.93	366	3.72	311
N	3.87	349	3.90	357	4.47	551	3.98	380	3.93	366	3.73	313
4	3.90	357	3.96	374	4.62	611	3.95	372	3.92	363	3.75	318
8	3.89	354	4.08	412	4.54	578	3.96	374	3.86	346	3.74	316
12	3.85	344	4.10	418	4.34	502	4.00	386	3.81	333	3.73	313
	June 16		June 17		June 18		June 19		June 20		June 21	
4	3.70	306	3.74	316	3.92	363	3.78	325	3.85	344	3.85	344
8	3.69	304	3.86	346	3.88	352	3.74	316	3.84	341	3.88	352
N	3.69	304	3.96	374	3.87	349	3.74	316	3.83	338	3.93	366
4	3.68	302	4.03	396	3.88	352	3.77	323	3.82	335	4.02	392
8	3.69	304	4.00	386	3.88	352	3.81	333	3.79	328	4.14	432
12	3.69	304	3.94	369	3.83	338	3.84	341	3.80	330	4.39	520

Supplemental record.- May 20, 3 p.m., 3.98 ft., 380 sec.-ft.; June 4, 2 p.m., 5.25 ft., 928 sec.-ft.; June 11, 6 p.m., 4.07 ft., 408 sec.-ft.

## Flint Creek near Maxville, Mont.

Location.- Lat.  $46^{\circ}32'$ , long.  $113^{\circ}14'$ , in NE $\frac{1}{4}$  sec. 21, T. 9 N., R. 13 W., 50 feet downstream from point of diversion of Allendale Canal and 4 miles north of Maxville.

Drainage area.- 324 square miles.

Gage-height record.- Wire-weight gage read once daily except May 24, July 4.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 140 second-feet and extended to peak stage by logarithmic plotting on basis of comparison with sum of flow at station at Maxville and Boulder Creek at Maxville. Discharge for days of no gage-height record computed on basis of records for station at Maxville. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge observed, 1,700 second-feet 9 a.m. June 4 (gage height, 6.39 feet).

1946 to April 1948: Discharge observed, 580 second-feet June 10, 1947 (gage height, 3.90 feet).

Remarks.- Many diversions for irrigation above and below gage. During irrigation season flow is supplemented by water from East Fork Rock Creek which is diverted in sec. 5, T. 4 N., R. 14 W., 500 feet below East Fork Rock Creek Dam, through a canal into Trout Creek, thence into Flint Creek. Some regulation by dam at Georgetown Lake.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1		756	876	11		748	279	21		916	248
2		956	716	12		940	265	22		1,120	230
3		1,120	660	13		710	218	23	996	1,070	213
4		1,700	590	14		696	178	24	850	1,000	235
5		1,500	512	15		674	163	25	804	916	213
6		1,020	441	16		654	181	26	836	804	205
7		748	391	17		640	170	27	844	748	201
8		740	353	18		618	185	28	828	674	193
9		732	270	19		584	235	29	796	640	205
10		732	218	20		576	239	30	788	590	201
								31	772	-	193
Monthly mean discharge, in second-feet										844	306
Runoff, in inches										-	-

## Flint Creek near Drummond, Mont.

Location.- Lat.  $46^{\circ}38'$ , long.  $113^{\circ}09'$ , in NW $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 18, T. 10 N., R. 13 W., at highway bridge  $1\frac{1}{2}$  miles upstream from mouth and  $2\frac{1}{2}$  miles south of Drummond.

Drainage area.- 492 square miles.

Gage-height record.- Wire-weight gage read once daily except July 4. Gage readings doubtful June 28, 29, July 5.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 900 second-feet and extended to peak stage. Discharge for days of doubtful or no gage-height record computed on basis of records for stations at Maxville and near Maxville.

Maxima.- May-June 1948: Discharge observed, 1,800 second-feet June 3 (gage height, 11.15 feet).

1946 to April 1948: Discharge not determined June 10, 1947 (gage height, 5.10 feet, site and datum then in use); gage height, 6.22 feet Jan. 7, 1947 (ice jam), site and datum then in use.

Remarks.- Many diversions above and below station for irrigation. During irrigation season flow is supplemented by water from East Fork Rock Creek which is diverted in sec. 5, T. 4 N., R. 14 W., 500 feet below East Fork Rock Creek Dam, through a canal into Trout Creek, thence into Flint Creek. Some regulation by Georgetown Lake.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1		849	596	11		772	247	21		1,020	244
2		951	800	12		800	199	22		1,640	213
3		1,800	699	13		807	166	23		1,020	207
4		1,640	600	14		842	157	24		1,070	213
5		1,250	500	15		687	150	25	899	1,040	224
6		1,060	442	16		719	161	26	958	965	230
7		988	392	17		752	157	27	1,050	907	238
8		899	311	18		655	143	28	973	800	235
9		1,020	256	19		620	322	29	958	700	269
10		793	224	20		988	301	30	921	602	250
								31	849		235

Trout Creek above main canal, near Philipsburg, Mont.

Location.- Lat. 46°10'30", long. 113°24'20", in NW $\frac{1}{4}$  sec. 19, T. 5 N., R. 14 W., just above drop for main supply canal from East Fork Rock Creek and 12 miles southwest of Philipsburg.

Drainage area.- 4.2 square miles.

Gage-height record.- Water-stage recorder graph except for periods May 1-13, May 27 to June 29.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 10 second-feet and extended to peak stage. Discharge for periods of no gage-height record computed on basis of recorded range in stage (1.45 feet to 1.89 feet) and records for nearby streams. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 23 second-feet 6 a.m. May 20, June 4; gage height, 1.90 feet May 20.

1945 to April 1948: Discharge, 26 second-feet April 14, 1947 (gage height, 1.97 feet).

Remarks.- Small diversion above station.

*Mean discharge, in second-feet, 1948*

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	11	10	11	11	12	13	8.0	21	11	11	6.9
2	10	11	10	12	12	15	7.4	22	11	12	6.6
3	10	15	9.2	13	12	14	7.2	23	11	13	6.6
4	10	20	8.9	14	13	12	7.2	24	10	12	6.6
5	9	18	8.3	15	11	11	7.2	25	9.6	11	6.6
6	9	17	8.0	16	10	11	7.2	26	9.1	11	6.4
7	11	16	8.0	17	10	10	6.9	27	8.5	10	6.6
8	14	15	7.7	18	10	10	7.2	28	7.5	10	6.6
9	13	14	7.7	19	13	10	7.7	29	8	9.5	6.6
10	11	12	7.4	20	16	10	7.2	30	8	9.2	6.4
								31	9		6.4
Monthly mean discharge, in second-feet .....									10.6	12.4	7.47
Runoff, in inches .....									2.90	3.29	2.05

*Gage height, in feet, and discharge, in second-feet, at indicated time, 1948*

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4					1.58	11	1.76	18				
8					1.62	12	1.83	20	1.61	12		
N	1.57	11	1.57	10	1.62	12	1.73	16			1.57	11
4					1.72	16	1.67	14	1.57	11		
8					1.72	16	1.62	12				
12	1.56	10	1.56	11	1.73	16	1.61	12	1.56	10	1.57	11
	May 23		May 24		May 25		May 26		May 27		May 28	
4									1.51	8.9		
8	1.57	11	1.56	10	1.54	9.8	1.52	9.2				
N												
4												
12	1.56	10	1.54	9.8	1.52	9.2	1.51	8.9				



## Trout Creek near Southern Cross, Mont.

Location.- Lat.  $46^{\circ}17'$ , long.  $113^{\circ}20'$ , in NW $\frac{1}{4}$  sec. 15, T. 6 N., R. 14 W., a quarter of a mile upstream from mouth,  $4\frac{1}{2}$  miles southwest of Phillipsburg, and  $6\frac{1}{2}$  miles northwest of Southern Cross.

Drainage area.- 34.8 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 80 second-feet and extended to peak stage by logarithmic plotting. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 124 second-feet (regulated) 10 a.m. June 23 (gage height, 4.18 feet).

1945 to April, 1948: Discharge, 331 second-feet Apr. 16, 1948 (gage height, 5.67 feet).

Remarks.- During irrigation season flow is supplemented by water from East Fork Rock Creek which is diverted in sec. 5, T. 4 N., R. 14 W., 500 feet below Rock Creek Dam, through a canal into Trout Creek.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	46	32	112	11	52	55	75	21	47	96	69
2	41	33	115	12	51	54	73	22	43	110	68
3	40	44	106	13	52	50	71	23	42	117	69
4	41	58	102	14	56	48	69	24	37	109	66
5	37	52	99	15	50	48	65	25	31	109	65
6	37	49	92	16	48	56	67	26	25	107	63
7	47	47	87	17	46	61	57	27	22	103	56
8	61	38	82	18	43	61	59	28	22	106	54
9	54	35	74	19	49	65	68	29	25	103	56
10	48	47	72	20	66	68	74	30	24	104	57
								31	24		56
Monthly mean discharge, in second-feet .....									42.2	68.8	74.1
Runoff, in inches .....									-	-	-

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	3.37	48	3.32	44	3.31	43	3.57	64	3.40	50	3.29	41
8	3.38	48	3.33	44	3.35	46	3.60	67	3.40	50	3.29	41
N	3.38	48	3.34	45	3.37	48	3.72	78	3.38	48	3.28	41
4	3.37	48	3.32	44	3.40	50	3.64	71	3.33	44	3.26	39
8	3.30	42	3.30	42	3.45	54	3.51	59	3.30	42	3.46	55
12	3.30	42	3.29	41	3.62	69	3.43	52	3.28	41	3.37	48
	May 23		May 24		May 25		May 26		May 27		May 28	
4					3.19	34	3.07	27				
8	3.31		3.25	38	3.19	34	3.07	27				
N					3.11	30	3.04	26	2.98	22	2.99	23
4	3.28	41	3.22	36	3.09	28	2.99	23				
8					3.07	27	2.98	22				
12	3.25	38	3.20	35	3.07	27	2.98	22	2.96	21	3.00	23
	May 29		May 30		May 31		June 1		June 2		June 3	
4	3.01	24					3.06	27	3.16	23	3.25	38
8	3.04	26					3.18	34	3.18	34	3.33	44
N	3.07	27	3.01	24	3.01	24	3.20	35	3.19	34	3.36	47
4	3.05	26					3.19	34	3.13	31	3.36	47
8	3.01	24					3.16	33	3.13	31	3.34	45
12	3.00	23	3.01	24	2.99	23	3.17	33	3.19	34	3.40	50
	June 4		June 5		June 6		June 7		June 8		June 9	
4	3.41	51					3.39	49	3.30	42	3.19	34
8	3.49	57	3.43	52			3.42	52	3.31	43	3.19	34
N	3.57	64			3.39	49	3.40	50	3.30	42	3.18	34
4	3.57	64	3.41	51			3.32	44	3.19	34	3.19	34
8	3.49	57					3.28	41	3.17	33	3.19	34
12	3.45	54	3.39	49	3.38	48	3.29	41	3.19	34	3.28	41
	June 10		June 11		June 12		June 13		June 14		June 15	
4	3.34	45	3.38	48	3.49	57			3.41	51	3.36	47
8	3.37	48	3.40	50	3.46	55	3.40	50	3.40	50	3.39	49
N	3.40	50	3.40	50	3.45	54			3.39	49	3.40	50
4	3.34	45	3.46	55	3.40	50	3.40	50	3.35	46	3.38	48
8	3.38	48	3.65	72	3.41	51			3.33	44	3.38	48
12	3.36	47	3.51	59	3.40	50	3.41	51	3.34	45	3.38	48
	June 16		June 17		June 18		June 19		June 20		June 21	
4	3.39	49	3.58	65	3.53	61	3.55	62	3.56	63	3.74	80
8	3.39	49	3.53	61	3.53	61	3.57	64	3.57	64	3.78	83
N	3.40	50	3.52	60	3.56	63	3.64	71	3.62	69	3.93	98
4	3.47	56	3.51	59	3.54	62	3.62	69	3.66	72	4.13	118
8	3.66	72	3.48	56	3.51	59	3.57	64	3.64	71	4.04	109
12	3.59	66	3.54	62	3.54	62	3.56	63	3.67	73	4.02	107

Supplemental record.- May 20, 10 a.m., 3.62 ft., 69 sec.-ft.; May 22, 6 p.m., 3.33 ft., 44 sec.-ft.; May 25, 10 a.m., 3.18 ft., 34 sec.-ft.; June 1, 2 a.m., 3.04 ft., 26 sec.-ft., 6 a.m., 3.15 ft., 32 sec.-ft.; June 2, 2 p.m., 3.14 ft., 31 sec.-ft.; June 4, 4 p.m., 3.59 ft., 66 sec.-ft.; June 7, 11 a.m., 3.44 ft., 53 sec.-ft., 1 p.m., 3.33 ft., 44 sec.-ft.; June 8, 1 p.m., 3.23 ft., 37 sec.-ft.; June 11, 3 p.m., 3.39 ft., 49 sec.-ft., 6 p.m., 3.71 ft., 77 sec.-ft.; June 12, 2 a.m., 3.55 ft., 62 sec.-ft.; June 16, 6 p.m., 3.63 ft., 70 sec.-ft.; June 17, 2 a.m., 3.61 ft., 68 sec.-ft.; June 20, 2 p.m., 3.67 ft., 73 sec.-ft.

## Boulder Creek at Maxville, Mont.

Location.- Lat. 46°28'30", long. 113°14'00", in SE $\frac{1}{4}$  sec. 4, T. 8 N., R. 13 W., an eighth of a mile upstream from mouth and three-quarters of a mile north of Maxville.

Drainage area.- 71.5 square miles.

Gage-height record.- Water-stage recorder graph except for period June 27-30.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 550 second-feet and extended to peak stage. Discharge for period of no gage-height record computed on basis of recorded range in stage and records for Flint Creek at Maxville.

Maxima.- May-June 1948: Discharge, 763 second-feet 5 p.m. June 3 (gage height, 4.24 feet).

1939 to April 1948: Discharge, 650 second-feet May 26, 1942 (gage height, 4.04 feet).

Remarks.- Several small diversions above station for irrigation.

## Mean discharge, in second-feet, 1948

Monthly mean discharge, in second-feet, 1961											
Day	May	June	July	Day	May	June	July	Day	May	June	July
1	67	404	171	11	70	326	95	21	483	224	75
2	60	426	188	12	67	314	91	22	527	289	68
3	57	620	156	13	75	250	82	23	436	277	66
4	58	642	142	14	81	216	78	24	372	265	69
5	54	511	130	15	78	190	73	25	410	248	62
6	57	432	120	16	85	197	75	26	447	226	58
7	69	411	113	17	119	222	68	27	462	210	58
8	81	376	105	18	196	196	67	28	525	190	69
9	77	332	92	19	274	175	78	29	485	180	78
10	70	309	98	20	378	167	86	30	421	157	73
								31	400		63
Monthly mean discharge, in second-feet.....									227	299	91.5
Runoff, in inches.....									3.67	4.67	1.48

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	2.23	105	2.62	183	2.89	255	3.16	342	3.50	462	3.75	560
8	2.25	108	2.63	185	2.92	264	3.23	366	3.49	458	3.72	548
N	2.27	112	2.63	185	2.94	271	3.25	373	3.46	448	3.63	512
4	2.29	115	2.69	200	2.95	274	3.29	387	3.53	473	3.60	500
8	2.42	140	2.77	221	3.02	296	3.35	408	3.69	536	3.59	496
12	2.55	167	2.83	238	3.11	325	3.48	455	3.82	588	3.60	500
	May 23		May 24		May 25		May 26		May 27		May 28	
4	3.59	496	3.28	383	3.58	419	3.52	470	3.50	462	3.73	552
8	3.48	455	3.22	363	3.52	397	3.47	451	3.46	448	3.69	536
N	3.39	422	3.18	349	3.28	383	3.40	426	3.42	433	3.63	512
4	3.32	397	3.16	342	3.27	380	3.37	415	3.42	433	3.60	500
8	3.31	394	3.28	383	3.43	437	3.46	448	3.59	496	3.65	520
12	3.33	401	3.38	419	3.53	473	3.52	470	3.67	528	3.67	528
	May 29		May 30		May 31		June 1		June 2		June 3	
4	3.63	512	3.48	455	3.39	422	3.42	433	3.52	470	3.56	485
8	3.58	492	3.40	426	3.34	404	3.34	404	3.45	444	3.72	548
N	3.52	470	3.33	401	3.26	376	3.25	373	3.35	408	3.92	628
4	3.51	466	3.28	383	3.23	367	3.21	359	3.28	383	4.17	732
8	3.52	470	3.35	408	3.32	397	3.35	408	3.34	404	4.15	722
12	3.52	470	3.42	433	3.43	437	3.50	462	3.44	440	4.17	732
	June 4		June 5		June 6		June 7		June 8		June 9	
4	4.01	664	3.72	548	3.49	458	3.46	448	3.34	404	3.19	353
8	3.97	648	3.65	520	3.43	437	3.38	419	3.28	383	3.14	337
N	3.95	640	3.63	512	3.37	415	3.31	394	3.21	359	3.10	324
4	3.91	624	3.56	485	3.32	397	3.27	380	3.21	359	3.07	314
8	3.89	616	3.52	470	3.39	422	3.31	394	3.23	366	3.09	321
12	3.83	592	3.52	470	3.47	451	3.36	412	3.22	363	3.11	327
	June 10		June 11		June 12		June 13		June 14		June 15	
4	3.09	321	3.10	324	3.21	359						
8	3.06	311	3.06	311	3.12	330	2.87	254	2.76	224	2.63	193
N	3.02	298	3.00	292	3.05	308						
4	2.99	289	3.02	298	2.98	286	2.84	245	2.69	207	2.61	188
8	3.06	311	3.25	373	2.94	274						
12	3.09	321	3.29	387	2.91	265	2.80	234	2.65	198	2.57	180
	June 16		June 17		June 18		June 19		June 20		June 21	
4	2.57	180	2.83	242	2.69	207					2.55	176
8	2.56	178	2.76	224	2.67	202	2.54	173	2.51	167	2.57	180
N	2.56	178	2.74	219	2.66	200					2.71	212
4	2.63	193	2.72	214	2.62	191	2.55	176	2.50	165	2.88	256
8	2.81	237	2.67	202	2.59	184					2.97	283
12	2.87	254	2.68	204	2.57	180	2.53	171	2.51	167	3.05	308

Supplemental record.- June 3, 5 p.m. 4.24 ft., 763 sec.-ft.; June 11, 2 p.m., 2.97 ft., 283 sec.-ft.



## Middle Fork Rock Creek near Philipsburg, Mont.

Location.- Lat.  $46^{\circ}11'$ , long.  $113^{\circ}30'$ , in NE $\frac{1}{4}$  sec. 17, T. 5 N., R. 15 W., half a mile upstream from East Fork, 2 $\frac{1}{2}$  miles upstream from West Fork, and 15 miles southwest of Philipsburg.

Drainage area.- 123 square miles.

Gage-height record.- Staff gage read twice daily.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 550 second-feet and extended to peak stage on basis of logarithmic plotting and slope-area measurement. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 1,360 second-feet 6:15 p.m. May 29 (gage height, 3.80 feet), by slope-area method.

1937 to April 1948: Discharge observed, 1,230 second-feet May 9, 1947 (gage height, 3.60 feet).

Remarks.- A few small diversions above station for irrigation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	184	1,120	388	11	200	810	246	21	1,030	467	178
2	178	1,130	412	12	206	832	236	22	1,080	508	178
3	175	1,240	408	13	239	733	233	23	1,100	550	170
4	175	1,230	400	14	236	570	221	24	1,020	555	164
5	164	1,080	388	15	242	503	209	25	997	541	162
6	170	967	353	16	268	494	206	26	1,140	522	156
7	192	985	306	17	353	485	203	27	1,310	472	151
8	200	1,020	275	18	517	480	198	28	1,310	429	154
9	195	925	255	19	690	467	189	29	1,330	412	164
10	198	854	249	20	985	433	178	30	1,150	376	164
								31	1,100	-	162
Monthly mean discharge, in second-feet									591	706	237
Runoff, in inches									5.53	6.40	2.22

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
May 17											
9	1.88	331	10	3.52	1,180	10	3.70	1,300	10	2.80	755
7	2.00	376	7	3.40	1,100	8	3.50	1,160	8	2.72	711
May 18											
10	2.30	503	9	3.76	1,330	8a	3.50	1,160	7	2.55	625
8	2.36	531	6	3.70	1,300	9p	3.20	985	7	2.34	522
May 19											
9	2.56	630	10	3.74	1,320	9	3.20	985	8	2.30	503
5	2.80	755	5	3.72	1,310	5	3.14	949	6	2.30	503
May 20											
10	3.20	985	7	3.72	1,310	10	3.20	985	8	2.28	494
5	3.20	985	6	3.80	1,360	7	3.20	985	8	2.28	494
May 21											
9	3.26	1,020	8	3.54	1,190	8	3.26	1,020	8	2.26	485
4	3.28	1,030	8	3.40	1,100	6	3.24	1,010	5	2.26	485
May 22											
8	3.30	1,040	8	3.40	1,100	9	3.20	985	8	2.26	485
4	3.40	1,100	7	3.40	1,100	9	3.00	865	6	2.24	476
May 23											
9	3.40	1,100	10	3.44	1,130	8	2.98	854	7	2.24	476
5	3.38	1,090	6	3.42	1,120	4	2.98	854	7	2.20	458
May 24											
7	3.34	1,070	9	3.44	1,130	10	2.90	810	9	2.10	416
4	3.18	973	6	3.44	1,130	4	2.90	810	7	2.18	450
May 25											
10	3.24	1,010	9	3.60	1,230	9	2.94	832	9	2.20	458
9	3.20	985	8	3.64	1,260	7	2.94	832	6	2.24	476

## Blackfoot River near Helmsville, Mont.

Location.- Lat. 46°56', long. 112°57', in NW 1/4 sec. 25, T. 14 N., R. 11 W., 2 miles downstream from Arrastre Creek and 5 miles northeast of Helmsville. Datum of gage is 4,301.29 feet above mean sea level, datum of 1929 (levels by Corps of Engineers).

Drainage area.- 481 square miles.

Gage-height record.- Water-stage recorder graph except for period 8 a.m. June 4 to 8 a.m. June 6, for which graph was drawn based on fragmentary gage-height record.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 2,500 second-feet and extended to peak stage by logarithmic plotting. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 3,180 second-feet 4 a.m. June 6 (gage height, 7.55 feet).

1940 to April 1948: Discharge, 3,080 second-feet June 15, 1943 (gage height, 7.33 feet).

Remarks.- Flow includes natural overflow channel on left bank, but does not include unnamed diversions past station. Flood flow not materially affected by storage or diversion.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	498	2,210	1,080	11	739	2,030	644	21	2,450	1,080	576
2	504	2,140	1,070	12	727	1,880	672	22	2,690	1,160	525
3	484	2,150	985	13	735	1,660	609	23	2,900	1,360	504
4	487	2,660	926	14	818	1,520	579	24	2,670	1,600	500
5	484	3,010	854	15	921	1,380	558	25	2,420	1,680	475
6	477	3,090	786	16	916	1,280	554	26	2,440	1,580	451
7	511	2,820	739	17	936	1,300	536	27	2,530	1,470	438
8	681	2,560	702	18	1,170	1,240	522	28	2,600	1,320	451
9	808	2,350	664	19	1,680	1,150	550	29	2,580	1,210	482
10	769	2,180	640	20	2,170	1,100	620	30	2,510	1,120	462
								31	2,330		428
Monthly mean discharge, in second-feet.....									1,440	1,776	632
Runoff, in inches.....									3.45	4.12	1.51

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948												
Hour	Gage height		Discharge		Gage height		Discharge		Gage height		Discharge	
	May 17		May 18		May 19		May 20		May 21		May 22	
4	3.76	912	4.00	1,030	4.89	1,490	5.83	2,050	6.35	2,380	6.66	2,580
8	3.76	912	4.09	1,080	5.06	1,590	5.95	2,120	6.41	2,420	6.71	2,610
N	3.79	926	4.24	1,150	5.23	1,690	6.03	2,170	6.46	2,450	6.78	2,660
4	3.83	945	4.42	1,240	5.33	1,750	6.14	2,240	6.51	2,480	6.92	2,750
8	3.88	970	4.58	1,320	5.52	1,860	6.22	2,290	6.55	2,510	7.05	2,830
12	3.93	995	4.74	1,410	5.70	1,970	6.29	2,340	6.62	2,550	7.13	2,880
May 23			May 24		May 25		May 26		May 27		May 28	
4	7.18	2,920	6.96	2,770	6.47	2,460	6.37	2,390	6.53	2,490	6.70	2,600
8	7.19	2,920	6.88	2,720	6.41	2,420	6.38	2,400	6.52	2,490	6.68	2,590
N	7.17	2,910	6.80	2,670	6.39	2,400	6.42	2,420	6.57	2,520	6.70	2,600
4	7.16	2,900	6.72	2,620	6.39	2,400	6.49	2,470	6.63	2,560	6.72	2,620
8	7.11	2,870	6.66	2,580	6.39	2,400	6.51	2,480	6.66	2,580	6.69	2,600
12	7.05	2,830	6.57	2,520	6.39	2,400	6.54	2,500	6.70	2,600	6.68	2,590
May 29			May 30		May 31		June 1		June 2		June 3	
4	6.69	2,600	6.61	2,550	6.36	2,380	6.13	2,230	6.02	2,160	5.89	2,080
8	6.66	2,580	6.61	2,550	6.30	2,340	6.08	2,200	5.98	2,140	5.90	2,090
N	6.65	2,570	6.58	2,530	6.25	2,310	6.08	2,200	5.97	2,130	5.93	2,110
4	6.65	2,570	6.53	2,490	6.23	2,300	6.08	2,200	5.98	2,140	6.01	2,160
8	6.64	2,570	6.46	2,450	6.22	2,290	6.07	2,200	5.97	2,130	6.08	2,200
12	6.62	2,550	6.42	2,420	6.19	2,270	6.05	2,180	5.93	2,110	6.33	2,360
June 4			June 5		June 6		June 7		June 8		June 9	
4	6.55	2,510	7.18	2,920	7.55	3,180	7.18	2,920	6.77	2,650	6.39	2,400
8	6.70	2,600	7.25	2,960	7.49	3,130	7.10	2,860	6.67	2,590	6.34	2,370
N	6.81	2,680	7.33	3,020	7.43	3,090	7.03	2,820	6.62	2,550	6.28	2,350
4	6.92	2,750	7.40	3,070	7.38	3,060	6.95	2,770	6.57	2,520	6.26	2,320
8	7.02	2,810	7.45	3,100	7.33	3,020	6.90	2,740	6.53	2,490	6.23	2,300
12	7.10	2,860	7.50	3,140	7.27	2,980	6.84	2,700	6.47	2,460	6.18	2,270
June 10			June 11		June 12		June 13		June 14		June 15	
4	6.11	2,220	5.89	2,080	5.66	1,950	5.26	1,710	5.03	1,570	4.73	1,410
8	6.05	2,180	5.83	2,050	5.62	1,920	5.19	1,660	5.00	1,560	4.69	1,380
N	6.02	2,160	5.79	2,020	5.58	1,900	5.16	1,650	4.95	1,530	4.68	1,380
4	6.03	2,170	5.76	2,010	5.51	1,860	5.13	1,630	4.89	1,490	4.67	1,370
8	6.02	2,160	5.74	1,990	5.43	1,810	5.10	1,610	4.85	1,470	4.61	1,340
12	5.97	2,130	5.69	1,960	5.35	1,760	5.07	1,590	4.81	1,450	4.57	1,320
June 16			June 17		June 18		June 19		June 20		June 21	
4	4.53	1,300	4.57	1,320	4.46	1,260	4.28	1,170	4.16	1,110	4.02	1,040
8	4.50	1,280	4.57	1,320	4.43	1,240	4.26	1,160	4.14	1,100	4.02	1,040
N	4.48	1,270	4.56	1,310	4.41	1,240	4.23	1,140	4.13	1,100	4.08	1,070
4	4.47	1,260	4.54	1,300	4.38	1,220	4.22	1,140	4.12	1,090	4.15	1,100
8	4.49	1,280	4.50	1,280	4.36	1,210	4.20	1,130	4.09	1,080	4.24	1,150
12	4.53	1,300	4.50	1,280	4.32	1,190	4.19	1,120	4.05	1,060	4.26	1,160

## Blackfoot River near Ovando, Mont.

Location.- Lat. 47°01', long. 113°07', in SE $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 34, T. 15 N., R. 13 W., a quarter of a mile upstream from Monture Creek and 5 miles west of Ovando. Datum of gage is 3,917.27 feet above mean sea level, datum of 1929 (Corps of Engineers bench mark).

Drainage area.- 1,280 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 6,700 second-feet and extended to peak stage. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 8,200 second-feet 10 a.m. May 22 (gage height, 6.84 feet).

1940 to April 1948: Discharge, 6,950 second-feet June 20, 1943 (gage height, 6.26 feet).

Floodmarks indicate stage of 10 feet reached in recent years.

Remarks.- Flood flow not materially affected by storage or diversion.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,360	5,650	2,140	11	2,090	4,460	1,310	21	5,850	2,360	1,280
2	1,580	5,370	2,100	12	1,990	4,040	1,370	22	7,890	2,440	1,170
3	1,340	5,620	2,010	13	1,980	3,660	1,310	23	7,570	2,610	1,100
4	1,350	6,870	1,920	14	2,020	3,350	1,240	24	7,000	2,880	1,070
5	1,350	6,990	1,820	15	2,050	3,080	1,190	25	6,570	2,970	1,050
6	1,360	6,650	1,690	16	2,100	2,900	1,170	26	6,500	2,860	983
7	1,480	6,260	1,600	17	2,500	2,870	1,130	27	6,630	2,730	950
8	1,920	5,670	1,520	18	3,170	2,730	1,100	28	6,660	2,570	961
9	2,180	5,220	1,420	19	4,350	2,560	1,180	29	6,600	2,390	1,000
10	2,120	4,850	1,340	20	5,150	2,430	1,310	30	6,090	2,240	1,020
								31	5,830		961
Monthly mean discharge, in second-feet .....									3,740	3,909	1,335
Runoff, in inches .....									3.37	3.40	1.20

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	4.08	2,210	4.51	2,900	5.08	3,990	5.57	5,030	5.77	5,510	6.66	7,740
8	4.12	2,270	4.62	3,100	5.18	4,200	5.58	5,060	5.81	5,600	6.81	8,130
N	4.14	2,300	4.68	3,200	5.26	4,370	5.62	5,150	5.85	5,700	6.82	8,150
4	4.15	2,320	4.72	3,280	5.32	4,490	5.65	5,220	5.90	5,820	6.75	7,970
8	4.18	2,360	4.78	3,390	5.42	4,700	5.67	5,270	6.05	6,180	6.70	7,840
12	4.31	2,570	4.94	3,710	5.53	4,950	5.71	5,560	6.45	7,190	6.68	7,750
	May 23		May 24		May 25		May 26		May 27		May 28	
4	6.65	7,710	6.52	7,370	6.31	6,830	6.23	6,620	6.25	6,670	6.26	6,700
8	6.65	7,710	6.46	7,220	6.28	6,750	6.25	6,670	6.26	6,700	6.28	6,750
N	6.59	7,550	6.37	6,980	6.22	6,590	6.21	6,570	6.26	6,700	6.26	6,700
4	6.56	7,480	6.28	6,750	6.14	6,400	6.14	6,400	6.23	6,620	6.24	6,640
8	6.52	7,370	6.23	6,620	6.09	6,280	6.10	6,300	6.20	6,540	6.21	6,570
12	6.53	7,400	6.26	6,700	6.16	6,440	6.18	6,490	6.23	6,620	6.24	6,640
	May 29		May 30		May 31		June 1		June 2		June 3	
4	6.25	6,670	6.11	6,320	5.96	5,960	5.89	5,800	5.78	5,530	5.67	5,270
8	6.25	6,670	6.06	6,200	5.96	5,960	5.89	5,800	5.76	5,480	5.71	5,360
N	6.21	6,570	6.00	6,060	5.91	5,840	5.85	5,700	5.73	5,410	5.74	5,440
4	6.22	6,590	5.95	5,940	5.87	5,750	5.79	5,560	5.68	5,290	5.87	5,750
8	6.20	6,540	5.91	5,840	5.83	5,650	5.74	5,440	5.64	5,200	6.00	6,060
12	6.16	6,440	5.93	5,890	5.86	5,720	5.75	5,460	5.64	5,200	6.16	6,440
	June 4		June 5		June 6		June 7		June 8		June 9	
4	6.23	6,620	6.43	7,140	6.28	6,750	6.19	6,520	5.93	5,890	5.74	5,440
8	6.30	6,800	6.42	7,110	6.27	6,720	6.17	6,470	5.90	5,820	5.71	5,360
N	6.34	6,900	6.39	7,030	6.26	6,700	6.10	6,300	5.85	5,700	5.66	5,240
4	6.38	7,010	6.35	6,930	6.22	6,590	6.02	6,110	5.78	5,530	5.60	5,100
8	6.42	7,110	6.30	6,800	6.19	6,520	5.95	5,940	5.73	5,410	5.56	5,010
12	6.43	7,140	6.28	6,750	6.20	6,540	5.93	5,890	5.73	5,410	5.55	4,990
	June 10		June 11		June 12		June 13		June 14		June 15	
4	5.56	5,010	5.37	4,600	5.18	4,200	4.97	3,770	4.82	3,470	4.66	3,170
8	5.56	5,010	5.36	4,580	5.14	4,110	4.95	3,730	4.79	3,410	4.64	3,130
N	5.51	4,900	5.31	4,370	5.11	4,050	4.92	3,670	4.77	3,370	4.62	3,100
4	5.45	4,770	5.27	4,390	5.07	3,970	4.89	3,610	4.72	3,280	4.59	3,040
8	5.39	4,640	5.23	4,300	5.02	3,870	4.86	3,550	4.69	3,220	4.56	2,990
12	5.36	4,580	5.20	4,240	4.99	3,810	4.84	3,510	4.67	3,190	4.54	2,950
	June 16		June 17		June 18		June 19		June 20		June 21	
4	4.52	2,920	4.53	2,930	4.45	2,800	4.34	2,610	4.25	2,470	4.18	2,360
8	4.52	2,920	4.55	2,970	4.44	2,780	4.32	2,580	4.24	2,450	4.17	2,340
N	4.51	2,900	4.49	2,860	4.42	2,740	4.30	2,550	4.23	2,440	4.17	2,340
4	4.49	2,860	4.47	2,830	4.39	2,690	4.29	2,530	4.20	2,390	4.16	2,330
8	4.49	2,860	4.46	2,810	4.37	2,660	4.27	2,500	4.19	2,380	4.19	2,380
12	4.50	2,880	4.46	2,810	4.35	2,630	4.26	2,490	4.19	2,380	4.21	2,410

Supplemental record.- May 22, 10 a.m., 6.84 ft., 8,200 sec.-ft.; June 4, 9 p.m. to June 5, 7 a.m., 6.43 ft., 7,140 sec.-ft.

## Blackfoot River near Bonner, Mont.

Location.- Lat. 46°54', long. 113°47', in SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 8, T. 13 N., R. 17 W., 4 miles northeast of Bonner, 6 miles downstream from Union Creek, and 6 miles upstream from mouth.

Drainage area.- 2,280 square miles.

Gage-height record.- Staff gage read once daily. Mean daily gage heights May 17 to June 21 computed from graph based on gage readings, floodmark, and records for station near Ovando and Clark Fork above Missoula.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 12,000 second-feet and extended to peak stage. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 16,300 second-feet 10 a.m. May 22 (gage height, 11.3 feet, from floodmark).  
1939 to April 1948: Discharge observed, 12,800 second-feet May 9, 1947 (gage height, 9.90 feet).

Remarks.- Flood flow not materially affected by diversions or artificial storage.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	3,920	11,200	3,320	11	5,920	8,580	2,140	21	12,200	4,470	1,940
2	4,240	10,800	3,080	12	5,580	7,900	2,100	22	15,200	4,410	1,810
3	4,020	11,000	3,050	13	5,680	7,260	2,060	23	13,700	4,520	1,760
4	4,080	12,300	3,030	14	5,760	6,670	2,030	24	13,000	4,780	1,670
5	3,920	12,400	2,870	15	5,700	6,300	1,960	25	12,500	4,660	1,600
6	3,890	11,600	2,670	16	5,640	6,050	1,850	26	12,300	4,470	1,550
7	4,380	10,700	2,540	17	5,890	5,760	1,780	27	12,600	4,360	1,520
8	6,110	10,100	2,430	18	7,260	5,460	1,720	28	13,100	4,080	1,520
9	6,300	9,560	2,300	19	9,060	5,010	1,780	29	13,000	3,790	1,600
10	5,980	9,100	2,240	20	10,900	4,750	2,020	30	12,300	3,600	1,560
								31	11,600	-	1,580
Monthly mean discharge, in second-feet									8,249	7,188	2,099
Runoff, in inches									4.17	3.51	1.06

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
8	May 17 6.48	6,050	8	May 26 9.74	12,400	8	June 4 9.80	12,500	8	June 13 7.10	7,040
8	May 18 7.54	7,790	8	May 27 9.94	12,900	7	June 5 9.69	12,300	8	June 14 6.76	6,500
8	May 19 8.56	9,820	8	May 28 10.13	13,300	7	June 6 9.24	11,300	8	June 15 6.58	6,210
8	May 20 9.32	11,400	8	May 29 9.94	12,900	7	June 7 8.89	10,500	8	June 16 6.41	5,940
8	May 21 9.93	12,800	8	May 30 9.55	12,000	8	June 8 8.61	9,920	8	June 17 6.26	5,700
8	May 22 10.62	14,500	8	May 31 9.36	11,500	8	June 9 8.34	9,350	8	June 18 5.27	5,280
8	May 23 10.23	13,600	8	June 1 9.16	11,100	7	June 10 8.18	9,020	8	June 19 5.72	4,890
8	May 24 9.93	12,800	8	June 2 8.98	10,700	7	June 11 7.82	8,310	8	June 20 5.58	4,690
8	May 25 9.71	12,300	2 p 8	June 3 9.08 9.32	10,900 11,400	7	June 12 7.48	7,690	8	June 21 5.36	4,380

Note.- All readings made after noon.

Nevada Creek above reservoir, near Finn, Mont.

Location.- Lat.  $46^{\circ}47'$ , long.  $112^{\circ}46'$ , in SW $\frac{1}{4}$  sec. 20, T. 12 N., R. 9 W., 2 miles upstream from Buffalo Creek and 3 miles west of Finn.

Drainage area.- 128 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 330 second-feet and extended to peak stage. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 557 second-feet 2 p.m. May 22 (gage height, 4.22 feet).

1939 to April 1948: Discharge, 1,440 second-feet Apr. 16, 1948 (gage height, 6.04 feet).

Remarks.- Flood flow not materially affected by diversions.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	121	224	100	11	202	137	66	21	465	93	54
2	108	194	119	12	157	146	65	22	532	95	47
3	95	213	92	13	146	118	54	23	477	142	46
4	99	273	78	14	159	105	49	24	361	145	48
5	91	284	68	15	153	85	47	25	327	148	41
6	86	265	61	16	145	99	47	26	314	170	37
7	117	218	58	17	170	163	44	27	308	137	38
8	246	177	57	18	294	100	44	28	315	117	44
9	272	150	54	19	444	89	64	29	320	99	55
10	228	128	52	20	491	87	63	30	285	92	47
								31	255		39
Monthly mean discharge, in second-feet										252	150
Runoff, in inches										2.27	1.31
											57.4
											0.52

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height		Discharge		Gage height		Discharge		Gage height		Discharge		Gage height		Discharge		
	May 17		May 18		May 19		May 20		May 21		May 22		May 23		May 24		
4	2.72	152	3.08	224	3.73	394	4.11	518	3.93	456	4.07	504	4.10	515	3.78	409	
8	2.77	161	3.22	255	3.81	418	4.08	508	3.95	462	4.14	529	4.03	490	3.74	397	
N	2.82	170	3.42	305	3.89	442	4.04	494	3.97	470	4.20	550	4.00	480	3.70	385	
4	2.87	179	3.53	334	3.93	456	3.99	476	3.96	466	4.20	550	4.94	459	3.65	370	
8	2.91	187	3.60	355	4.06	501	3.95	462	3.95	462	4.18	543	3.88	439	3.57	346	
12	2.98	202	3.67	376	4.12	522	3.93	456	4.04	494	4.15	532	3.83	424	3.54	337	
		May 23		May 24		May 25		May 26		May 27		May 28					
4	4.10	515	3.78	409	3.52	331	3.45	312	3.43	308	3.40	300	4.03	490	3.74	397	
8	4.03	490	3.74	397	3.52	331	3.47	318	3.45	312	3.40	300	4.00	480	3.70	385	
N	4.00	480	3.70	385	3.53	334	3.49	322	3.46	315	3.44	310	4.94	459	3.65	370	
4	4.94	459	3.65	370	3.50	325	3.47	318	3.44	310	3.52	331	3.88	439	3.57	346	
8	3.88	439	3.57	346	3.46	315	3.43	303	3.41	302	3.53	334	3.83	424	3.54	337	
12	3.83	424	3.54	337	3.45	312	3.42	305	3.39	298	3.49	322					
		May 29		May 30		May 31		June 1		June 2		June 3					
4	3.45	312	3.39	298	3.26	265	3.12	232	2.97	200	2.87	179	3.45	312	3.36	290	
8	3.45	312	3.36	290	3.25	262	3.10	228	2.96	198	2.95	196	3.49	322	3.35	288	
N	3.49	322	3.35	288	3.23	258	3.10	228	2.96	198	3.08	224	3.54	337	3.31	278	
4	3.54	337	3.31	278	3.20	250	3.07	221	2.94	193	3.20	250	3.49	322	3.28	270	
8	3.49	322	3.28	270	3.16	241	3.04	215	2.89	183	3.12	232	3.43	308	3.27	268	
12	3.43	308	3.27	268	3.13	235	3.00	206	2.87	179	3.06	219					
		June 4		June 5		June 6		June 7		June 8		June 9					
4	3.13	235	3.32	280	3.32	280	3.11	230	2.90	185	2.76	159	3.31	278	3.32	280	
8	3.31	278	3.32	280	3.30	275	3.10	228	2.90	185	2.75	157	3.36	295	3.34	285	
N	3.38	295	3.34	285	3.28	270	3.08	224	2.89	183	2.74	155	3.54	337	3.35	288	
4	3.56	290	3.35	288	3.24	260	3.04	215	2.83	172	2.69	146	3.34	285	3.34	285	
8	3.34	285	3.34	285	3.17	243	2.97	200	2.78	162	2.64	138	3.35	288	3.35	288	
12	3.35	288	3.35	288	3.13	235	2.93	191	2.76	159	2.61	134					
		June 10		June 11		June 12		June 13		June 14		June 15					
4	2.60	132	2.57	128	2.83	172	2.43	109	2.45	112	2.26	88	2.60	132	2.57	128	
8	2.60	132	2.57	128	2.75	157	2.48	115	2.44	110	2.26	88	2.60	132	2.56	126	
N	2.60	132	2.56	126	2.67	143	2.57	128	2.43	109	2.26	88	2.54	124	2.54	124	
4	2.54	124	2.54	124	2.61	134	2.56	126	2.38	103	2.21	82	2.51	119	2.77	161	
8	2.51	119	2.77	161	2.52	121	2.51	119	2.32	95	2.18	79	2.55	125	2.90	185	
12	2.55	125	2.90	185	2.45	112	2.48	115	2.27	89	2.17	78					
		June 16		June 17		June 18		June 19		June 20		June 21					
4	2.18	79	3.00	206	2.43	109	2.26	88	2.25	87	2.22	83	2.18	79	3.00	206	
8	2.19	80	2.84	174	2.39	104	2.25	87	2.25	87	2.23	85	2.20	81	2.77	151	
N	2.20	81	2.77	151	2.36	100	2.29	92	2.24	86	2.32	95	2.18	79	2.75	151	
4	2.18	79	2.75	151	2.33	97	2.28	91	2.26	88	2.38	103	2.66	142	2.58	129	
8	2.66	142	2.58	129	2.28	91	2.27	89	2.25	87	2.36	100	2.92	189	2.47	114	
12	2.92	189	2.47	114	2.27	89	2.25	87	2.23	85	2.33	97					



## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

Nevada Creek near Helmville, Mont.

Location.- Lat. 46°49', long. 112°52', in SW<sup>1</sup>/<sub>4</sub> sec. 4, T. 12 N., R. 10 W., 2 miles downstream from Nevada Creek Reservoir and 6 miles southeast of Helmville.

Drainage area.- 165 square miles.

Gage-height record.- Staff gage read once daily. No gage-height record June 1, 2, July 13-16, 21-25, 27, 29, 30.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 220 second-feet and extended to peak stage. Stage-discharge relation uncertain July

4-8. Discharge for periods of uncertain stage-discharge relation and no gage-height record computed on basis of records for station above reservoir near Finn. Gage heights used to hundredths. Shifting-control method used June 9 to July 3.

Maxima.- May-June 1948: Discharge, 470 second-feet probably on May 22 (gage height, 5.3 feet, from floodmark).

1946 to April 1948: Discharge observed, 260 second-feet June 13, 1947 (gage height, 4.22 feet).

Maximum stage known, about 6 feet, from information by local resident.

Remarks.- Almost complete regulation by Nevada Creek Reservoir. Several diversions above station for irrigation.

*Mean discharge, in second-feet, 1948*

[illegible]

## West Fork Bitterroot River near Conner, Mont.

Location.- Lat. 45°44', long. 114°17', in NE¼NW¼ sec. 26, T. 1 S., R. 22 W., half a mile below West Fork Dam, 6 miles upstream from Nez Perce Creek, and 16 miles southwest of Conner.

Drainage area.- 322 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 3,880 second-feet 5 p.m. May 29 (gage height, 6.08 feet).

1941 to April 1948: Discharge, 4,020 second-feet May 9, 1947 (gage height, 6.17 feet).

Remarks.- Flood flow affected by West Fork Bitterroot River Reservoir, 0.3 mile upstream.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	281	2,590	556	11	296	1,400	326	21	3,020	768	256
2	281	2,530	531	12	274	1,280	326	22	3,020	838	235
3	281	2,600	502	13	699	1,140	299	23	2,770	819	221
4	281	2,550	478	14	870	1,030	288	24	2,510	789	215
5	281	2,230	442	15	916	964	277	25	2,540	760	202
6	281	2,000	406	16	988	910	263	26	2,840	721	192
7	281	1,890	384	17	1,320	868	256	27	2,990	672	188
8	281	1,840	367	18	1,970	790	256	28	3,190	622	202
9	284	1,710	342	19	2,560	786	270	29	3,710	580	228
10	288	1,550	330	20	2,940	751	277	30	3,590	545	215
								31	2,900		192
Monthly mean discharge, in second-feet.....									1,559	1,284	307
Runoff, in inches.....									5.58	4.45	1.10

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	3.58	1,150	4.27	1,760	4.77	2,270	5.23	2,790	5.48	3,090	5.44	3,040
8	3.71	1,260	4.40	1,880	4.80	2,300	5.34	2,920	5.46	3,060	5.45	3,050
N	3.78	1,320	4.53	2,010	4.83	2,330	5.42	3,010	5.42	3,010	5.45	3,050
4	3.85	1,380	4.61	2,090	4.86	2,370	5.45	3,050	5.38	2,970	5.43	3,030
8	3.93	1,450	4.66	2,150	4.95	2,460	5.45	3,050	5.37	2,950	5.39	2,980
12	4.10	1,600	4.72	2,210	5.08	2,610	5.46	3,060	5.40	2,990	5.36	2,940
	May 23		May 24		May 25		May 26		May 27		May 28	
4	5.32	2,890	5.07	2,600	4.99	2,510	5.20	2,750	5.41	3,000	5.51	3,120
8	5.28	2,850	5.03	2,550	5.02	2,540	5.26	2,820	5.43	3,030	5.57	3,190
N	5.22	2,770	4.99	2,510	5.03	2,550	5.30	2,870	5.40	2,990	5.59	3,220
4	5.16	2,700	4.94	2,450	5.03	2,550	5.30	2,870	5.39	2,980	5.58	3,210
8	5.10	2,630	4.91	2,420	5.03	2,550	5.33	2,910	5.38	2,970	5.59	3,220
12	5.08	2,610	4.95	2,460	5.12	2,650	5.37	2,950	5.44	3,040	5.67	3,320
	May 29		May 30		May 31		June 1		June 2		June 3	
4	5.82	3,520	5.88	3,600	5.45	3,050	5.14	2,680	5.04	2,560	5.03	2,550
8	5.94	3,690	5.81	3,500	5.40	2,990	5.10	2,630	5.05	2,580	5.07	2,600
N	6.06	3,850	5.72	3,390	5.33	2,910	5.07	2,600	5.02	2,540	5.10	2,630
4	6.06	3,850	5.63	3,270	5.23	2,790	5.02	2,540	4.99	2,510	5.08	2,610
8	6.04	3,830	5.55	3,170	5.18	2,730	4.99	2,510	4.96	2,480	5.09	2,620
12	5.95	3,700	5.50	3,110	5.15	2,690	5.00	2,520	4.98	2,500	5.14	2,680
	June 4		June 5		June 6		June 7		June 8		June 9	
4	5.12	2,650	4.86	2,370	4.60	2,080	4.45	1,930	4.39	1,870	4.29	1,780
8	5.08	2,610	4.80	2,300	4.56	2,040	4.43	1,910	4.38	1,860	4.27	1,760
N	5.03	2,550	4.73	2,220	4.52	2,000	4.40	1,880	4.35	1,830	4.22	1,710
4	4.98	2,500	4.67	2,160	4.47	1,950	4.39	1,870	4.36	1,840	4.18	1,670
8	4.93	2,440	4.63	2,110	4.43	1,910	4.36	1,840	4.32	1,800	4.14	1,640
12	4.89	2,400	4.61	2,090	4.44	1,920	4.37	1,850	4.30	1,780	4.13	1,630
	June 10		June 11		June 12		June 13		June 14		June 15	
4	4.11	1,610	3.90	1,420	3.83	1,360	3.58	1,150	3.47	1,070	3.31	962
8	4.09	1,590	3.89	1,410	3.78	1,320	3.57	1,150	3.44	1,050	3.31	962
N	4.05	1,560	3.87	1,390	3.73	1,280	3.56	1,140	3.41	1,030	3.33	974
4	4.00	1,510	3.88	1,400	3.68	1,230	3.55	1,130	3.38	1,010	3.33	974
8	3.96	1,470	3.87	1,390	3.63	1,190	3.53	1,110	3.34	981	3.30	955
12	3.92	1,440	3.86	1,390	3.59	1,160	3.51	1,100	3.31	962	3.30	955
	June 16		June 17		June 18		June 19		June 20		June 21	
4	3.28	942	3.20	890	3.09	819	3.02	777	3.01	771	2.94	732
8	3.24	916	3.20	890	3.06	801	3.05	795	2.98	754	2.95	758
N	3.22	903	3.18	877	3.04	789	3.06	801	2.97	748	2.98	754
4	3.20	890	3.15	858	3.01	771	3.04	789	2.96	743	3.03	783
8	3.19	884	3.12	838	3.00	765	3.03	783	2.94	732	3.08	813
12	3.20	890	3.10	825	2.99	760	3.03	783	2.94	732	3.12	838

Supplemental record.- May 28, 6 p.m., 5.55 ft., 3,170 sec.-ft.; May 29, 2 p.m., 6.02 ft., 3,800 sec.-ft., 5 p.m., 6.08 ft., 3,880 sec.-ft.

## Bitterroot River near Darby, Mont.

Location.- Lat. 45°59', long. 114°09', in NE<sup>1</sup>/<sub>4</sub> sec. 36, T. 3 N., R. 21 W., just below bridge on U. S. Highway 93, a quarter of a mile downstream from Chaffin Creek and 4 miles southeast of Darby.

Drainage area.- 1,050 square miles.

Gage-height record.- Water-stage recorder graph except for period 3 a.m. to 4 p.m. May 20, and 4 p.m. July 22 to 4 p.m. July 25, for which graph was drawn based on observer's reading and fragmentary gage-height record.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 10,900 second-feet and extended to peak stage. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 11,300 second-feet 11 a.m. May 29 (gage height, 8.12 feet).

1937 to April 1948: Discharge, 11,500 second-feet May 9, 1947 (gage height, 8.18 feet).

Remarks.- Flood runoff affected slightly by artificial storage. Many diversions above station for irrigation.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,720	8,460	2,240	11	1,950	5,310	1,440	21	8,790	2,990	1,110
2	1,550	8,260	2,240	12	1,870	4,790	1,450	22	9,290	3,200	980
3	1,460	8,620	2,030	13	2,360	4,420	1,280	23	8,750	2,930	882
4	1,460	8,220	1,920	14	2,920	4,050	1,170	24	7,880	2,850	855
5	1,380	7,090	1,800	15	2,880	3,660	1,100	25	8,170	2,760	802
6	1,450	6,690	1,690	16	3,110	3,580	1,040	26	8,960	2,630	725
7	1,900	6,650	1,590	17	3,760	3,300	990	27	9,340	2,450	685
8	2,340	6,610	1,500	18	5,420	2,920	990	28	10,200	2,330	725
9	2,160	6,190	1,400	19	6,630	3,040	1,130	29	11,000	2,250	882
10	2,010	5,650	1,330	20	8,560	2,870	1,180	30	10,400	2,170	882
								31	9,350		759
Monthly mean discharge, in second-feet									5,130	4,565	1,252
Runoff, in inches									5.64	4.85	1.37

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	4.55	3,480	5.41	5,000	5.98	6,160	6.81	8,030	7.16	8,860	7.28	9,150
8	4.57	3,510	5.58	5,340	6.13	6,490	7.00	8,480	7.16	8,860	7.40	9,450
N	4.73	3,780	5.67	5,520	6.18	6,600	7.17	8,890	7.17	8,890	7.44	9,550
4	4.79	3,880	5.72	5,620	6.25	6,750	7.20	8,960	7.11	8,740	7.40	9,450
8	4.89	4,050	5.82	5,820	6.38	7,040	7.16	8,860	7.06	8,620	7.30	9,200
12	5.15	4,510	5.88	5,950	6.57	7,480	7.12	8,770	7.13	8,790	7.26	9,100
	May 23		May 24		May 25		May 26		May 27		May 28	
4	7.27	9,130	6.87	8,170	6.85	8,120	7.15	8,840	7.42	9,500	7.68	10,200
8	7.24	9,060	6.83	8,080	6.94	8,340	7.29	9,180	7.44	9,550	7.82	10,500
N	7.16	8,860	6.75	7,900	6.92	8,290	7.27	9,130	7.37	9,380	7.77	10,400
4	7.03	8,550	6.67	7,710	6.86	8,150	7.19	8,940	7.29	9,180	7.66	10,100
8	6.91	8,260	6.59	7,530	6.82	8,060	7.15	8,840	7.23	9,030	7.62	10,000
12	6.86	8,150	6.68	7,730	6.96	8,380	7.31	9,220	7.48	9,650	7.71	10,200
	May 29		May 30		May 31		June 1		June 2		June 3	
4	7.90	10,700	7.99	10,900	7.58	9,900	7.18	8,310	7.03	8,550	7.05	8,600
8	8.06	11,100	7.91	10,700	7.52	9,750	7.14	8,820	7.04	8,580	7.12	8,770
N	8.08	11,200	7.81	10,500	7.38	9,400	6.98	8,430	6.94	8,340	7.11	8,740
4	8.09	11,200	7.65	10,100	7.26	9,100	6.85	8,120	6.78	7,960	7.06	8,620
8	8.06	11,100	7.55	9,820	7.12	8,770	6.78	7,960	6.76	7,920	7.03	8,550
12	8.02	11,000	7.47	9,620	7.13	8,790	6.68	8,190	6.89	8,220	7.06	8,620
	June 4		June 5		June 6		June 7		June 8		June 9	
4	7.12	8,770	6.54	7,410	6.32	6,910	6.33	6,930	6.37	7,020	6.17	6,570
8	7.07	8,650	6.51	7,340	6.33	6,930	6.26	6,770	6.31	6,880	6.10	6,420
N	6.94	8,340	6.43	7,160	6.25	6,750	6.23	6,710	6.17	6,570	5.98	6,160
4	6.75	7,900	6.31	6,880	6.12	6,460	6.13	6,400	6.02	6,240	5.85	5,880
8	6.62	7,600	6.21	6,660	6.10	6,420	6.03	6,270	6.07	6,350	5.84	5,860
12	6.57	7,480	6.24	6,730	6.19	6,620	6.24	6,730	6.13	6,490	5.92	6,030
	June 10		June 11		June 12		June 13		June 14		June 15	
4	5.92	6,030	5.67	5,520	5.47	5,120	5.14	4,490	5.07	4,370	4.72	3,760
8	5.84	5,860	5.66	5,500	5.43	5,040	5.12	4,460	5.01	4,260	4.71	3,750
N	5.72	5,620	5.54	5,260	5.32	4,830	5.11	4,440	4.90	4,070	4.67	3,680
4	5.59	5,360	5.52	5,220	5.19	4,580	5.07	4,370	4.77	3,850	4.61	3,580
8	5.55	5,280	5.47	5,120	5.11	4,440	5.06	4,350	4.68	3,700	4.57	3,510
12	5.62	5,420	5.43	5,040	5.12	4,460	5.07	4,370	4.69	3,710	4.67	3,680
	June 16		June 17		June 18		June 19		June 20		June 21	
4	4.72	3,760	4.57	3,510	4.28	3,050	4.25	3,000	4.22	2,960	4.13	2,820
8	4.70	3,730	4.52	3,430	4.23	2,980	4.31	3,100	4.21	2,940	4.15	2,860
N	4.62	3,590	4.45	3,320	4.19	2,920	4.32	3,110	4.16	2,870	4.19	2,920
4	4.55	3,480	4.37	3,190	4.14	2,840	4.30	3,080	4.10	2,780	4.27	3,040
8	4.48	3,370	4.32	3,110	4.10	2,780	4.26	3,020	4.09	2,770	4.39	3,220
12	4.52	3,430	4.31	3,100	4.13	2,820	4.23	2,980	4.11	2,800	4.48	3,370

Supplemental record.- May 20, 10 p.m., 7.10 ft., 8,720 sec.-ft.; May 24, 6 a.m., 6.82 ft., 8,060 sec.-ft.; May 27, 10 p.m., 7.31 ft., 9,220 sec.-ft.; May 29, 11 a.m., 8.12 ft., 11,300 sec.-ft.; May 30, 2 a.m., 8.07 ft., 11,200 sec.-ft.; June 7, 2 p.m., 6.23 ft., 6,710 sec.-ft.; June 9, 6 p.m., 5.82 ft., 5,820 sec.-ft.

## East Fork Bitterroot River at Conner, Mont.

Location.- Lat. 45°56', long. 114°08', in SE $\frac{1}{4}$  sec. 7, T. 2 N., R. 20 W., 100 feet below highway bridge at Conner and half a mile upstream from confluence with West Fork.

Drainage area.- 404 square miles.

Gage-height record.- Graph drawn on basis of twice-daily wire-weight gage readings, observation of crest gage height, and shape of recorder graph of Bitterroot River near Darby for period May 17 to June 21. Average of twice-daily readings used May 1-17, June 22 to July 31. No gage reading July 4.

Discharge record.- Stage-discharge relation defined by current-meter measurements and shape of previous curve below 2,650 second-feet and extended to peak stage. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 3,760 second-feet 10 a.m. May 29 (gage height, 5.70 feet).

1937 to April 1948: Discharge observed, 3,630 second-feet May 9, 1947 (gage height, 5.78 feet).

Remarks.- Flow during flood period not affected by diversions.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	475	2,600	595	11	738	1,580	425	21	3,280	886	337
2	449	2,620	629	12	755	1,530	421	22	3,520	980	315
3	415	2,640	619	13	755	1,370	380	23	3,340	961	290
4	424	2,540	570	14	778	1,290	360	24	3,010	957	282
5	386	2,300	521	15	796	1,110	349	25	3,100	906	265
6	420	2,120	485	16	846	1,050	341	26	3,340	846	262
7	424	2,120	468	17	1,020	981	333	27	3,440	794	268
8	492	1,980	459	18	1,570	842	326	28	3,550	703	282
9	732	1,700	430	19	2,170	883	341	29	3,570	624	290
10	721	1,640	425	20	3,090	826	349	30	2,950	581	290
								31	2,580		279
Monthly mean discharge, in second-feet.										1,774	387
Runoff, in inches										5.05	1.10

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	3.19	983	3.73	1,430	4.22	1,930	5.05	2,920	5.39	3,360	5.42	3,400
8	3.23	1,010	3.82	1,520	4.27	1,990	5.16	3,060	5.40	3,370	5.55	3,560
N	3.22	1,000	3.89	1,590	4.34	2,060	5.21	3,120	5.34	3,290	5.65	3,700
4	3.23	1,010	3.94	1,640	4.47	2,210	5.26	3,190	5.27	3,200	5.57	3,590
8	3.32	1,080	4.01	1,710	4.74	2,540	5.29	3,230	5.27	3,200	5.48	3,470
12	3.50	1,220	4.10	1,800	4.90	2,730	5.35	3,300	5.33	3,280	5.47	3,460
	May 23		May 24		May 25		May 26		May 27		May 28	
4	5.50	3,500	5.19	3,100	5.14	3,030	5.37	3,330	5.44	3,420	5.60	3,630
8	5.52	3,530	5.18	3,080	5.28	3,210	5.52	3,530	5.52	3,530	5.66	3,710
N	5.46	3,450	5.14	3,030	5.27	3,200	5.49	3,490	5.50	3,500	5.62	3,660
4	5.27	3,200	5.07	2,940	5.19	3,100	5.34	3,290	5.44	3,420	5.49	3,490
8	5.17	3,070	5.04	2,900	5.14	3,030	5.28	3,210	5.39	3,360	5.38	3,340
12	5.18	3,080	5.06	2,930	5.22	3,140	5.33	3,280	5.30	3,500	5.43	3,410
	May 29		May 30		May 31		June 1		June 2		June 3	
4	5.56	3,580	5.16	3,170	4.79	2,760	4.72	2,680	4.76	2,730	4.66	2,620
8	5.66	3,710	5.03	3,020	4.80	2,770	4.80	2,770	4.84	2,810	4.71	2,670
N	5.69	3,750	4.93	2,910	4.64	2,600	4.72	2,680	4.73	2,690	4.75	2,720
4	5.56	3,610	4.84	2,810	4.44	2,400	4.60	2,560	4.56	2,520	4.72	2,680
8	5.37	3,400	4.78	2,750	4.41	2,370	4.49	2,450	4.50	2,460	4.63	2,590
12	5.27	3,290	4.77	2,740	4.48	2,440	4.57	2,530	4.58	2,540	4.65	2,610
	June 4		June 5		June 6		June 7		June 8		June 9	
4	4.69	2,650	4.44	2,400	4.27	2,230	4.28	2,240	4.24	2,200	3.82	1,820
8	4.69	2,650	4.43	2,390	4.26	2,220	4.22	2,180	4.17	2,130	3.76	1,770
N	4.61	2,570	4.36	2,320	4.18	2,140	4.19	2,150	3.98	1,960	3.65	1,680
4	4.52	2,480	4.25	2,210	4.04	2,020	4.12	2,090	3.81	1,810	3.56	1,610
8	4.44	2,400	4.19	2,150	4.00	1,980	4.01	1,990	3.80	1,800	3.55	1,600
12	4.44	2,400	4.24	2,200	4.12	2,090	4.14	2,110	3.84	1,840	3.62	1,660
	June 10		June 11		June 12		June 13		June 14		June 15	
4	3.70	1,720	3.58	1,620	3.58	1,620	3.29	1,390	3.19	1,320	2.97	1,160
8	3.70	1,720	3.61	1,650	3.60	1,640	3.25	1,360	3.16	1,300	2.93	1,140
N	3.62	1,660	3.54	1,590	3.51	1,570	3.24	1,360	3.14	1,280	2.88	1,100
4	3.53	1,580	3.48	1,540	3.40	1,480	3.24	1,360	3.14	1,280	2.83	1,070
8	3.50	1,560	3.46	1,530	3.33	1,420	3.23	1,350	3.11	1,260	2.80	1,040
12	3.53	1,580	3.46	1,530	3.31	1,410	3.23	1,350	3.04	1,210	2.84	1,070
	June 16		June 17		June 18		June 19		June 20		June 21	
4	2.87	1,090	2.84	1,070	2.53	876	2.48	846	2.49	852	2.39	794
8	2.84	1,070	2.78	1,030	2.50	858	2.61	924	2.48	846	2.40	800
N	2.81	1,050	2.71	986	2.47	841	2.63	937	2.46	835	2.50	858
4	2.78	1,030	2.63	937	2.44	823	2.57	900	2.41	806	2.63	937
8	2.78	1,030	2.57	900	2.42	812	2.51	864	2.38	789	2.75	1,010
12	2.80	1,040	2.55	888	2.40	800	2.50	858	2.39	794	2.80	1,040

## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

Rock Creek near Darby, Mont.

Location.— Lat. 46°04', long. 114°13', in SW $\frac{1}{4}$  sec. 28, T. 4 N., R. 21 W., 500 feet upstream from diversion dam,  $\frac{1}{4}$  miles downstream from Como Lake, and 4 miles northwest of Darby.

Drainage area.- 55.5 square miles.

Gage-height record.- Gage read once daily. Doubtful gage-height record July 23-25, 27-31.  
No gage-height record May 1-15.

Discharge record. - Stage-discharge relation defined by current-meter measurements. Discharge for May 1-15 computed on basis of records of gate changes. Discharge for days of doubtful gage-height record computed on basis of records for Rock Creek Canal.

Maxima. - May-June 1948: Discharge observed, 1,500 second-feet 7 a.m. May 27 (gage height, 5.78 feet).

1946: Discharge observed, 408 second-feet May 10, July 4-10, 1946 (gage height, 4.10 feet).

Remarks.- Flow regulated by Como Lake. No record during high-water period in 1947.

*Mean discharge, in second-feet, 1948*

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	66	1,100	320	11	230	824	313	21	900	192	291
2	66	1,190	320	12	230	835	313	22	851	192	284
3	66	1,270	328	13	230	835	320	23	862	284	284
4	66	1,290	351	14	230	824	320	24	874	399	284
5	66	1,220	351	15	230	789	320	25	939	457	284
6	66	1,220	343	16	360	778	320	26	1,080	457	264
7	130	1,220	336	17	372	449	320	27	1,500	432	250
8	230	1,080	328	18	482	205	306	28	1,430	359	250
9	230	1,080	320	19	812	198	306	29	1,430	359	250
10	230	1,080	320	20	812	198	306	30	1,430	359	250
								31	1,310	-	250
Monthly mean discharge, in second-feet .....									575	706	303
Runoff, in inches .....									11.99	14.17	6.30

Rock Creek Canal near Darby, Mont.

Location.- Lat. 46°04', long. 114°13', in SW<sup>1</sup>/<sub>4</sub> sec. 28, T. 4 N., R. 21 W., a quarter of a mile downstream from diversion dam, 1½ miles downstream from Como Lake, and 4 miles northwest of Darby.

Gage-height record.- Staff gage read once daily except periods May 1-29, June 1.

Discharge records.— Stage-discharge relation defined by current-meter measurements. Discharge for June 1 interpolated.

Maxima. - May-June 1948: Discharge observed, 286 second-feet July 1-17 (gage height, 4.64 feet).

1946: Discharge observed, 347 second-feet Apr. 25 to May 8, 1946; gage height, 5.06 feet July 22-29, Aug. 2-22, 1946.

Remarks.- Canal diverts from Rock Creek for irrigation. No records for 1947.

*Mean discharge, in second-feet, 1948*

mean discharge, in second-feet				mean discharge, in second-feet			
Day	May	June	July	Day	May	June	July
1		251	286	11		0	286
2		251	286	12		0	286
3		262	286	13		0	286
4		215	286	14		0	286
5		158	286	15		93	286
6		136	286	16		124	286
7		136	286	17		124	286
8		134	286	18		124	283
9		134	286	19		124	283
10		0	286	20		118	280
							31
Monthly mean discharge, in second-feet .....					-		123
Runoff, in inches .....					-		-

## Blodgett Creek near Corvallis, Mont.

Location.- Lat. 46°16', long. 114°13', in NW¼ sec. 21, T. 6 N., R. 21 W., 4½ miles upstream from mouth and 7 miles southwest of Corvallis.

Drainage area.- 26.8 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 510 second-feet and extended to peak stage. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 812 second-feet 3:30 a.m. May 28 (gage height, 6.33 feet).

1947 to April 1948: Discharge, 750 second-feet 3:30 a.m. May 9, 1947 (gage height, 6.10 feet).

Remarks.- Flow slightly affected by storage for irrigation in High Lake and Blodgett Lake.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	127	465	170	11	124	461	70	21	541	262	57
2	111	521	174	12	120	366	63	22	616	248	46
3	106	663	137	13	150	380	59	23	496	200	41
4	113	515	120	14	166	338	51	24	423	188	39
5	103	439	117	15	150	298	48	25	515	178	33
6	111	460	104	16	172	308	44	26	593	168	30
7	176	511	93	17	255	241	41	27	646	156	28
8	186	523	82	18	405	203	43	28	689	170	34
9	156	509	74	19	493	222	50	29	688	180	57
10	135	456	71	20	616	243	60	30	523	178	53
								31	463		46
Monthly mean discharge, in second-feet .....									328	335	68.9
Runoff, in inches .....									14.07	13.95	2.96

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	3.98	229	4.84	430	4.92	449	5.93	706	5.33	552	5.85	685
8	4.04	242	4.85	432	4.98	464	5.90	698	5.28	539	5.77	664
N	4.04	242	4.74	405	5.03	476	5.65	633	5.18	514	5.58	615
4	4.05	244	4.64	382	5.11	496	5.36	559	5.10	494	5.37	562
8	4.23	285	4.64	382	5.26	534	5.20	519	5.34	554	5.33	552
12	4.61	374	4.80	420	5.61	623	5.26	534	5.74	656	5.41	572
	May 23		May 24		May 25		May 26		May 27		May 28	
4	5.42	574	4.94	454	5.36	559	5.75	659	5.97	716	6.33	812
8	5.27	536	4.87	437	5.27	536	5.59	617	5.83	680	6.10	750
N	5.09	492	4.72	401	5.08	489	5.37	562	5.57	612	5.85	685
4	4.90	444	4.62	377	4.94	454	5.19	516	5.38	564	5.62	625
8	4.82	425	4.73	403	5.10	494	5.35	552	5.53	602	5.48	589
12	4.88	439	5.12	499	5.60	620	5.84	682	6.03	732	5.64	630
	May 29		May 30		May 31		June 1		June 2		June 3	
4	5.89	695	5.57	612	5.23	526	5.18	514	5.43	576	6.05	737
8	6.03	732	5.38	564	5.12	499	5.10	494	5.32	549	6.16	766
N	6.09	747	5.14	504	4.94	454	4.91	446	5.10	494	5.85	685
4	5.86	688	4.94	454	4.77	413	4.74	406	4.92	449	5.57	612
8	5.66	636	4.91	446	4.78	415	4.86	434	5.08	489	5.42	574
12	5.64	630	5.09	492	4.99	466	5.27	536	5.55	607	5.47	586
	June 4		June 5		June 6		June 7		June 8		June 9	
4	5.45	582	5.06	484	5.18	514	5.42	574	5.56	610	5.50	594
8	5.30	544	4.98	464	5.06	484	5.23	526	5.27	536	5.25	532
N	5.14	504	4.84	430	4.83	427	4.98	464	4.99	466	4.97	462
4	5.01	472	4.70	396	4.67	389	4.85	432	4.84	430	4.80	420
8	4.95	456	4.69	394	4.67	437	5.12	499	5.11	496	4.99	466
12	5.02	474	4.97	462	5.30	544	5.55	607	5.52	599	5.34	554
	June 10		June 11		June 12		June 13		June 14		June 15	
4	5.30	544	5.35	556	4.87	437	4.57	365	4.72	401	4.46	338
8	5.06	484	5.10	494	4.68	391	4.57	365	4.56	362	4.44	334
N	4.78	415	4.84	430	4.48	343	4.71	398	4.38	319	4.20	278
4	4.58	367	4.69	394	4.36	315	4.72	401	4.25	290	4.12	260
8	4.70	396	4.76	410	4.57	317	4.64	382	4.28	296	4.12	260
12	5.14	504	4.90	444	4.51	350	4.68	391	4.43	331	4.36	315
	June 16		June 17		June 18		June 19		June 20		June 21	
4	4.56	362	4.17	271	3.96	224	3.95	222	4.12	260	4.07	248
8	4.47	341	4.11	257	3.89	209	3.96	224	4.09	253	4.07	248
N	4.33	308	4.01	235	3.83	196	3.93	218	4.03	240	4.06	246
4	4.19	276	3.93	218	3.78	186	3.94	220	3.97	226	4.12	260
8	4.14	264	3.92	215	3.77	184	3.98	229	4.01	235	4.23	285
12	4.17	271	3.98	229	3.88	207	4.02	237	4.08	251	4.36	315

## Blodgett Creek near Corvallis, Mont.--Continued

Supplemental record:

May 19, 7 a.m., 5.02 ft., 474 sec.-ft.; 7 p.m., 5.30 ft., 544 sec.-ft.  
22, 2 a.m., 5.84 ft., 682 sec.-ft.  
24, 6 p.m., 4.63 ft., 379 sec.-ft.  
25, 3 a.m., 5.35 ft., 556 sec.-ft.; 6 p.m., 4.96 ft., 459 sec.-ft.  
26, 2 a.m., 5.74 ft., 656 sec.-ft.; 6 p.m., 5.20 ft., 519 sec.-ft.  
27, 3 a.m., 5.99 ft., 721 sec.-ft.; 6 p.m., 5.38 ft., 564 sec.-ft.  
28, 3:30 a.m., 6.33 ft., 812 sec.-ft.  
30, 6 p.m., 4.89 ft., 442 sec.-ft.  
31, 6 p.m., 4.73 ft., 403 sec.-ft.  
June 1, 2 a.m., 5.12 ft., 499 sec.-ft.; 6 p.m., 4.74 ft., 406 sec.-ft.  
2, 2 a.m., 5.40 ft., 569 sec.-ft.; 6 p.m., 4.94 ft., 454 sec.-ft.  
3, 6 a.m., 6.20 ft., 777 sec.-ft.; 6 p.m., 5.46 ft., 584 sec.-ft.  
6, 2 a.m., 5.12 ft., 499 sec.-ft.  
7, 3 a.m., 5.44 ft., 579 sec.-ft.; 3 p.m., 4.85 ft., 432 sec.-ft.;  
6 p.m., 4.93 ft., 452 sec.-ft.  
8, 2 a.m., 5.61 ft., 623 sec.-ft.; 2 p.m., 4.88 ft., 439 sec.-ft.;  
6 p.m., 4.92 ft., 449 sec.-ft.  
9, 2 a.m., 5.58 ft., 615 sec.-ft.; 6 p.m., 4.84 ft., 430 sec.-ft.  
10, 5 p.m., 4.58 ft., 367 sec.-ft.  
11, 2 a.m., 5.35 ft., 556 sec.-ft.; 5 p.m., 4.67 ft., 389 sec.-ft.  
12, 6 p.m., 4.33 ft., 308 sec.-ft.  
13, 6 a.m., 4.54 ft., 358 sec.-ft.  
14, 2 a.m., 4.73 ft., 403 sec.-ft.; 6 p.m., 4.23 ft., 285 sec.-ft.  
15, 2 a.m., 4.47 ft., 341 sec.-ft.; 10 p.m., 4.19 ft., 276 sec.-ft.  
16, 2 a.m., 4.50 ft., 348 sec.-ft.; 7 p.m., 4.13 ft., 262 sec.-ft.;  
10 p.m., 4.17 ft., 271 sec.-ft.  
20, 6 a.m., 4.13 ft., 262 sec.-ft.; 6 p.m., 3.97 ft., 226 sec.-ft.

## Bear Creek near Victor, Mont.

Location.- Lat. 46°23', long. 114°13', in NE $\frac{1}{4}$  sec. 9, T. 7 N., R. 21 W., 5 miles southwest of Victor.

Drainage area.- 26.6 square miles.

Gage-height record.- Water-stage recorder graph except for period May 21-24.

Discharge record.- Stage-discharge relation defined by current meter measurements below

530 second-feet and extended to peak stage. Shifting-control method used 11 p.m. May 26 to 10 p.m. May 28. Discharge for period of no gage-height record computed from graph drawn on basis of records for Blodgett Creek near Corvallis. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 1,100 second-feet 12 p.m. May 27 (gage height, 3.80 feet).

1938 to April 1948: Discharge, 865 second-feet Apr. 18, 1938, from rating curve extended above 400 second-feet; gage height, 3.70 feet May 24, 1942.

Remarks.- No regulation or diversion.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	119	513	158	11	101	476	48	21	594	279	42
2	100	579	121	12	103	410	44	22	658	261	35
3	92	701	92	13	130	420	41	23	479	196	32
4	92	545	81	14	138	348	39	24	453	174	31
5	84	479	77	15	125	296	37	25	585	158	29
6	95	495	69	16	149	318	36	26	660	163	28
7	139	570	61	17	263	314	35	27	761	150	27
8	143	581	55	18	400	227	34	28	812	152	34
9	121	552	52	19	527	208	35	29	759	148	61
10	105	501	50	20	561	197	42	30	525	142	53
								31	491		41
Monthly mean discharge, in second-feet .....									334	352	52.3
Runoff, in inches .....									14.41	14.73	2.26

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	2.34	214	2.94	416	3.01	444	3.49	684	3.24	547	3.6	750
8	2.36	220	2.88	392	3.09	478	3.35	603	3.20	527	3.5	690
N	2.36	220	2.80	362	3.16	509	3.25	542	3.16	509	3.4	630
4	2.49	257	2.85	381	3.23	542	3.15	504	3.24	547	3.2	527
8	2.80	362	2.95	420	3.38	619	3.19	522	3.6	750	3.4	630
12	2.94	416	3.00	440	3.52	702	3.24	547	3.7	815	3.4	630
	May 23		May 24		May 25		May 26		May 27		May 28	
4	3.3	576	3.0	440	3.29	571	3.49	684	3.34	744	3.64	996
8	3.1	482	2.9	400	3.20	527	3.34	598	3.20	660	3.44	866
N	3.0	440	2.8	362	3.12	491	3.23	542	3.06	585	3.24	744
4	2.9	400	3.0	440	3.18	518	3.28	566	3.20	660	3.12	672
8	3.0	440	3.25	552	3.53	708	3.64	776	3.69	964	3.13	678
12	3.0	440	3.36	608	3.59	744	3.51	846	3.80	1,100	3.19	774
	May 29		May 30		May 31		June 1		June 2		June 3	
4	3.26	816	2.84	575	2.73	523	2.78	546	2.89	600	3.27	822
8	3.36	879	2.72	518	2.65	488	2.66	492	2.76	537	3.19	774
N	3.22	792	2.62	475	2.55	446	2.55	446	2.60	466	3.01	666
4	3.03	678	2.58	458	2.54	442	2.52	434	2.64	483	2.91	610
8	3.03	678	2.74	527	2.66	492	2.80	555	3.00	660	2.92	616
12	2.98	649	2.79	550	2.80	555	3.00	660	3.23	798	2.96	638
	June 4		June 5		June 6		June 7		June 8		June 9	
4	2.88	595	2.70	509	2.63	475	2.81	560	2.84	575	2.80	555
8	2.79	550	2.61	470	2.53	438	2.68	500	2.71	514	2.70	509
N	2.71	514	2.54	442	2.45	407	2.57	454	2.60	466	2.57	454
4	2.69	505	2.50	426	2.56	450	2.75	532	2.80	555	2.72	518
8	2.73	523	2.68	500	2.91	610	3.09	714	3.08	708	2.96	638
12	2.75	532	2.72	518	2.95	632	3.04	684	2.99	654	2.92	616
	June 10		June 11		June 12		June 13		June 14		June 15	
4	2.76	537	2.71	514	2.61	470	2.40	388	2.46	417	2.25	335
8	2.60	466	2.55	446	2.46	411	2.54	442	2.33	363	2.15	302
N	2.48	418	2.46	411	2.32	359	2.52	434	2.22	325	2.05	272
4	2.51	430	2.48	418	2.29	349	2.45	407	2.16	306	1.99	255
8	2.80	555	2.70	509	2.43	399	2.50	426	2.27	342	2.06	275
12	2.85	580	2.75	532	2.45	407	2.52	434	2.33	363	2.17	309
	June 16		June 17		June 18		June 19		June 20		June 21	
4	2.31	356	2.41	392	1.98	252	1.89	227	1.75	190	1.99	155
8	2.26	338	2.27	342	1.91	233	1.85	216	1.73	186	2.01	261
N	2.15	302	2.13	296	1.83	211	1.81	206	1.71	180	2.07	278
4	2.07	278	2.01	261	1.79	200	1.77	196	1.75	190	2.19	315
8	2.13	296	2.01	261	1.84	214	1.75	190	1.86	219	2.35	370
12	2.35	370	2.04	270	1.90	230	1.76	193	1.93	238	2.31	356



## Burnt Fork Creek near Stevensville, Mont.

Location.- Lat. 46°28', long. 113°57', in SW $\frac{1}{4}$  sec. 11, T. 8 N., R. 19 W., at highway bridge, 8 miles southeast of Stevensville.

Drainage area.- 74 square miles.

Gage-height record.- Staff gage read once daily except Sundays and holidays.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 420 second-feet. Gage heights used to hundredths. Discharge interpolated on days of no gage-height record.

Maxima.- May-June 1948: Discharge observed, 565 second-feet noon May 28, 29 (gage height, 2.54 feet).

1920-24, 1938 to April 1948: Discharge observed, 641 second-feet May 28, 1938 (gage height, 2.92 feet).

Remarks.- Several diversions above station for irrigation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	119	449	150	11	160	363	85	21	458	233	66
2	110	449	146	12	160	354	84	22	502	282	64
3	101	458	136	13	188	330	84	23	450	260	60
4	101	467	120	14	200	305	84	24	414	246	60
5	94	440	100	15	188	282	78	25	405	239	55
6	101	427	94	16	220	260	78	26	440	226	49
7	141	414	94	17	253	260	78	27	458	200	46
8	188	414	91	18	346	226	71	28	565	182	49
9	170	405	91	19	371	219	74	29	565	177	60
10	160	380	87	20	502	225	71	30	547	155	53
								31	500		46
Monthly mean discharge, in second-feet									296	311	80.8
Runoff, in inches									4.61	4.69	1.26

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 17			May 26			June 4			June 12	
	1.80	253		2.26	440		2.32	467		2.06	354
	May 18			May 27			June 5			June 14	
	2.04	346		2.30	458		2.26	440		1.94	305
	May 19			May 28			June 6			June 15	
	2.10	371		2.54	565	10a	2.23	427		1.88	282
	May 20			May 29			June 7			June 16	
	2.40	502		2.54	565		2.20	414		1.82	260
	May 21			May 30			June 8			June 17	
	2.30	458		2.5	547		2.20	414		1.82	260
	May 22			June 1			June 9			June 18	
	2.40	502		2.28	449		2.18	405		1.72	226
	May 24			June 2			June 10			June 19	
	2.20	414		2.28	449		2.12	380		1.70	219
	May 25			June 3			June 11			June 21	
	2.18	405		2.30	458		2.08	363		1.74	233

Note.- Time for all readings is noon except May 30. (unknown), June 6 (10 a.m.), and July 18 (4 p.m.)

Flathead River at Flathead, British Columbia  
(International gaging station)

Location.- Lat. 49°00', long. 114°29', at highway bridge, 0.2 mile north of international boundary, 0.2 mile northwest of Flathead, British Columbia, and 7 miles northwest of Trail Creek, Mont.

Drainage area.- 450 square miles.

Gage-height record.- Staff-gage read twice daily except for period May 17 to June 5, when there was no gage-height record.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 8,000 second-feet and extended to peak stage. Discharge for period of no gage-height record computed on basis of records for station near Columbia Falls, Mont.

Maxima.- May-June 1948: Discharge, 14,600 second-feet May 23, 1948 (gage height, 9.1 feet, from floodmark).

1929 to April 1948: Discharge observed, 10,600 second-feet June 17, 1933 (gage height, 7.10 feet, revised).

Remarks.- No regulation or diversion above station. This station is one of the international gaging stations maintained by Canada under agreement with the United States.

*Mean discharge, in second-feet, 1948*

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2,670	6,400	1,500	11	1,690	3,660	883	21	9,090	2,450	957
2	2,070	7,000	1,340	12	1,730	3,390	855	22	11,000	2,230	785
3	1,780	6,900	1,250	13	1,820	3,280	827	23	14,600	2,230	738
4	1,810	6,900	1,160	14	1,830	3,060	778	24	14,500	2,340	690
5	1,730	6,100	1,100	15	1,840	2,880	744	25	11,500	2,290	648
6	1,690	4,950	1,060	16	1,840	2,740	720	26	11,300	2,180	630
7	1,780	5,160	1,030	17	2,320	3,140	708	27	11,700	2,010	636
8	1,780	5,130	1,020	18	3,900	3,320	690	28	12,000	1,800	897
9	1,790	4,950	967	19	6,560	3,140	696	29	11,300	1,660	1,280
10	1,810	4,490	911	20	9,090	2,610	720	30	8,500	1,600	1,560
								31	6,200	-	1,580
Monthly mean discharge, in second-feet.....									5,590	3,670	947
Runoff, in inches.....									14.32	9.11	2.42

*Gage height, in feet, and discharge, in second-feet, at indicated time, 1948*

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
June 6			June 10			June 14			June 18		
5:45p	4.95	4,950	8	4.80	4,650	8	3.95	3,010	8	4.15	3,370
			6:55	4.64	4,330	8	5.00	5,050	6:45	4.10	3,280
June 7			June 11			June 15			June 19		
8	5.10	5,260	8	4.40	3,850	8a	3.90	2,920	8a	4.05	3,190
8	5.00	5,050	8	4.20	3,470	8:30p	3.85	2,830	8:20p	4.00	3,100
June 8			June 12			June 16			June 20		
8	5.10	5,260	8	4.18	3,440	8	3.80	2,740	8	3.80	2,740
8	4.98	5,010	7:25	4.15	3,380	8	3.80	2,740	8	3.65	2,500
June 9			June 13			June 17			June 21		
8	4.90	4,850	8	4.10	3,280	8	3.95	3,010	8	3.63	2,470
7:20	4.80	4,650	6:30	4.10	3,280	8	4.10	3,280	8	3.60	2,420

## Flathead River near Columbia Falls, Mont.

Location.- Lat. 48°29', long. 114°05', in NW¼ sec. 7, T. 31 N., R. 19 W., three-quarters of a mile upstream from Middle Fork and 10 miles northeast of Columbia Falls. Datum of gage is 3,109.70 feet above mean sea level, datum of 1929 (levels by Bureau of Reclamation).

Drainage area.- 1,620 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 16,000 second-feet and extended to peak stage. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 26,400 second-feet 4 a.m. May 24 (gage height, 11.84 feet).

1910-17, 1929 to April 1948: Discharge, 29,500 second-feet June 20, 1916 (gage height, 9.8 feet, site and datum then in use).

Remarks.- No diversion or regulation.

## Mean discharge, in second-feet, 1948

mean discharges, in second-feet											
Day	May	June	July	Day	May	June	July	Day	May	June	July
1	8,540	17,200	5,690	11	5,900	12,700	3,150	21	17,000	7,990	2,780
2	7,180	17,800	5,360	12	5,670	11,500	3,020	22	19,900	7,780	2,650
3	6,320	17,800	4,930	13	6,010	10,600	2,890	23	25,300	7,880	2,520
4	6,360	17,800	4,570	14	6,430	9,820	2,780	24	25,200	8,140	2,450
5	5,880	17,000	4,260	15	6,140	9,560	2,700	25	22,200	8,220	2,350
6	5,650	15,900	4,000	16	6,100	9,050	2,640	26	22,000	7,760	2,250
7	6,190	15,600	3,610	17	6,820	9,610	2,550	27	22,900	7,160	2,180
8	6,920	15,700	3,730	18	9,190	10,100	2,450	28	23,800	6,620	2,550
9	7,020	15,600	3,500	19	13,200	9,330	2,410	29	22,100	6,160	4,030
10	6,410	14,400	3,300	20	16,500	8,420	2,690	30	19,300	5,880	4,480
								31	17,000		4,830
Monthly mean discharge, in second-feet .....									12,420	11,300	3,340
Runoff, in inches .....									8.84	7.79	2.38

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	6.35	6,460	7.00	8,040	8.21	11,600	9.40	16,000	9.64	16,900	9.93	18,100
8	6.40	6,570	7.18	8,520	8.42	12,400	9.49	16,300	9.63	16,900	10.05	18,600
N	6.46	6,710	7.39	9,090	8.63	13,100	9.57	16,700	9.61	16,800	10.28	19,600
4	6.56	6,940	7.63	9,780	8.87	14,100	9.61	16,800	9.65	17,000	10.52	20,600
8	6.68	7,230	7.82	10,400	9.08	14,700	9.62	16,900	9.70	17,200	10.81	21,900
12	6.84	7,630	8.01	11,000	9.26	15,400	9.63	16,900	9.80	17,600	11.09	23,100
	May 23		May 24		May 25		May 26		May 27		May 28	
4	11.35	24,200	11.84	25,400	11.03	22,800	10.78	21,700	10.96	22,500	11.31	24,000
8	11.51	24,900	11.79	25,200	10.93	22,400	10.83	21,900	10.96	22,500	11.39	24,400
N	11.68	25,700	11.65	25,600	10.86	22,100	10.85	21,900	10.96	22,500	11.30	24,000
4	11.75	26,000	11.41	24,500	10.81	21,900	10.83	21,900	11.17	23,100	11.21	23,600
8	11.80	26,300	11.28	23,800	10.78	21,700	10.95	22,500	11.17	23,400	11.16	23,400
12	11.82	26,400	11.15	23,300	10.78	21,700	10.99	22,600	11.24	23,700	11.13	23,300
	May 29		May 30		May 31		June 1		June 2		June 3	
4	11.10	23,100	10.50	20,500	9.73	17,300	9.62	16,900	9.83	17,700	9.84	17,800
8	10.97	22,500	10.36	19,900	9.67	17,100	9.65	17,000	9.85	17,800	9.83	17,700
N	10.86	22,100	10.19	19,200	9.62	16,900	9.67	17,100	9.84	17,800	9.84	17,800
4	10.86	21,700	10.05	18,600	9.61	16,800	9.71	17,200	9.85	17,800	9.86	17,800
8	10.67	21,300	9.92	18,100	9.63	16,900	9.78	17,500	9.86	17,800	9.87	17,900
12	10.62	21,000	9.83	17,700	9.62	16,900	9.82	17,700	9.86	17,800	9.88	17,900
	June 4		June 5		June 6		June 7		June 8		June 9	
4	9.88	17,900	9.77	17,500	9.44	16,100	9.28	15,500	9.32	15,700	9.31	15,600
8	9.89	18,000	9.72	17,300	9.40	16,000	9.29	15,600	9.34	15,700	9.33	15,700
N	9.87	17,900	9.65	17,000	9.35	15,800	9.28	15,500	9.34	15,700	9.31	15,600
4	9.64	17,800	9.59	16,700	9.32	15,700	9.29	15,600	9.35	15,800	9.31	15,600
8	9.81	17,600	9.54	16,500	9.33	15,700	9.31	15,600	9.35	15,800	9.27	15,500
12	9.80	17,600	9.48	16,300	9.31	15,600	9.31	15,600	9.33	15,700	9.19	15,200
	June 10		June 11		June 12		June 13		June 14		June 15	
4	9.11	14,900	8.69	13,300	8.24	11,700	7.98	10,900	7.65	9,840	7.62	9,750
8	9.03	14,600	8.61	13,000	8.21	11,600	7.93	10,700	7.63	9,780	7.57	9,660
N	8.96	14,300	8.51	12,700	8.18	11,500	7.88	10,600	7.63	9,780	7.59	9,600
4	8.92	14,100	8.43	12,400	8.14	11,400	7.85	10,400	7.63	9,780	7.53	9,490
8	8.87	14,000	8.37	12,200	8.08	11,200	7.78	10,200	7.64	9,810	7.48	9,340
12	8.78	13,600	8.29	11,900	8.03	11,000	7.71	10,000	7.64	9,810	7.44	9,230
	June 16		June 17		June 18		June 19		June 20		June 21	
4	7.41	9,150	7.40	9,120	7.73	10,100	7.59	9,660	7.23	8,650	7.02	8,090
8	7.37	9,040	7.50	9,400	7.73	10,100	7.53	9,490	7.17	8,490	7.00	8,040
N	7.36	9,010	7.60	9,690	7.73	10,100	7.48	9,340	7.14	8,410	6.97	7,960
4	7.35	8,980	7.67	9,900	7.72	10,100	7.42	9,180	7.10	8,300	6.96	7,940
8	7.36	9,010	7.71	10,000	7.69	9,960	7.36	9,010	7.07	8,220	6.95	7,810
12	7.36	9,010	7.72	10,100	7.64	9,810	7.28	8,790	7.05	8,170	6.92	7,830

## Flathead River at Columbia Falls, Mont.

Location.- Lat. 48°22', long. 114°11', in SW $\frac{1}{4}$  sec. 17, T. 30 N., R. 20 W., 200 feet downstream from highway bridge at Columbia Falls and 5 miles downstream from South Fork. Datum of gage is 2,978.00 feet above mean sea level, datum of 1929 (levels by Corps of Engineers).

Drainage area.- 4,440 square miles.

Gage-height record.- Water-stage recorder graph except 12 p.m. May 21 to 10 a.m.

May 22, for which partly estimated graph was drawn.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 85,400 second-feet and extended to peak stage on basis of revised figure for 1894 peak. Gage heights used to hundredths. Discharge obtained by shifting-control method July 6-31.

Maxima.- May-June 1948: Discharge, 102,000 second-feet 9 a.m. May 23 (gage height, 19.08 feet).

1922-23, 1928 to April 1948: Discharge, 102,000 second-feet June 1, 1923 (gage height, 17.3 feet).

Maximum stage known, 22.7 feet in June 1894, from floodmarks (discharge, 135,000 second-feet, revised).

Remarks.- No diversion.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	29,000	61,200	18,100	11	22,200	44,200	9,230	21	71,500	25,900	7,640
2	24,200	64,400	16,800	12	20,800	39,200	8,810	22	89,000	25,100	7,170
3	21,600	66,500	15,400	13	22,200	35,500	8,350	23	99,400	25,000	6,820
4	21,400	72,500	14,100	14	24,800	33,000	7,990	24	84,100	25,400	6,700
5	20,300	66,100	13,200	15	23,200	31,900	7,690	25	75,500	25,300	6,400
6	19,600	58,900	12,600	16	22,700	30,600	7,430	26	78,900	23,600	6,020
7	21,600	56,900	11,900	17	25,800	33,500	7,120	27	83,900	22,000	5,810
8	26,200	57,400	11,200	18	38,700	33,500	6,900	28	84,100	20,500	6,450
9	27,200	56,200	10,400	19	55,300	30,100	6,800	29	75,400	19,600	8,990
10	24,400	50,600	9,740	20	65,700	27,000	7,380	30	64,200	19,000	9,680
								31	58,100		9,980
Monthly mean discharge, in second-feet.....									45,840	39,350	9,445
Runoff, in inches.....									11.87	9.88	2.46

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	8.60	23,700	10.27	32,700	12.87	49,800	14.54	62,800	15.46	70,400	16.6	80,100
8	8.78	24,600	10.85	36,200	13.36	53,500	14.74	64,400	15.53	71,000	17.1	84,400
N	9.00	25,700	11.38	39,600	13.72	56,300	14.93	65,900	15.56	71,300	17.87	90,900
4	9.19	26,600	11.76	42,000	13.99	58,400	15.08	67,200	15.56	71,300	18.29	94,600
8	9.40	27,800	12.04	44,000	14.21	60,200	15.24	68,500	15.71	72,500	18.57	97,100
12	9.74	29,700	12.32	45,900	14.36	61,400	15.36	69,600	16.04	75,300	18.76	98,800
	May 23		May 24		May 25		May 26		May 27		May 28	
4	18.97	101,000	17.84	90,600	16.03	75,300	16.21	76,800	16.84	82,100	17.26	85,700
8	19.07	102,000	17.43	87,200	16.09	75,800	16.46	78,900	17.06	84,000	17.33	86,300
N	19.01	101,000	17.10	84,400	16.12	76,000	16.61	80,200	17.20	85,200	17.18	85,000
4	18.86	99,700	16.68	80,800	16.08	75,700	16.61	80,200	17.18	85,000	17.00	83,500
8	18.50	96,500	16.27	77,300	16.00	75,000	16.57	79,800	17.14	84,700	16.78	81,600
12	18.16	93,400	16.07	75,600	16.04	75,300	16.61	80,200	17.15	84,800	16.58	79,900
	May 29		May 30		May 31		June 1		June 2		June 3	
4	16.51	79,300	15.22	68,400	13.98	58,500	14.12	59,500	14.66	63,800	14.79	64,800
8	16.30	77,600	14.97	66,300	13.97	58,300	14.35	61,100	14.80	64,900	14.92	65,900
N	16.04	75,300	14.67	63,900	13.94	58,000	14.44	62,000	14.86	65,400	15.04	66,800
4	15.83	73,600	14.44	62,000	13.92	57,900	14.47	62,300	14.79	64,800	15.08	67,200
8	15.60	71,600	14.21	60,200	13.88	57,500	14.45	62,100	14.71	64,200	15.13	67,600
12	15.39	69,800	14.03	58,700	13.95	58,100	14.52	62,700	14.72	64,300	15.29	69,000
	June 4		June 5		June 6		June 7		June 8		June 9	
4	15.55	71,200	15.37	69,600	14.27	60,700	13.81	57,000	13.88	57,500	13.78	56,700
8	15.77	73,000	15.13	67,600	14.18	59,900	13.85	57,300	13.98	58,300	13.85	57,300
N	15.88	74,000	14.93	65,900	14.08	59,100	13.85	57,300	14.00	58,500	13.82	57,100
4	15.88	74,000	14.72	64,300	13.93	57,900	13.79	56,800	13.87	57,500	13.72	56,300
8	15.73	72,700	14.51	62,600	13.79	56,800	13.72	56,300	13.72	56,300	13.54	54,800
12	15.56	71,300	14.37	61,500	13.76	56,600	13.77	56,700	13.71	56,200	13.38	53,600
	June 10		June 11		June 12		June 13		June 14		June 15	
4	13.19	52,200	12.40	46,500	11.54	40,600	10.88	36,400	10.38	33,400	10.19	32,200
8	13.07	51,300	12.23	45,300	11.45	40,000	10.80	35,900	10.37	33,300	10.18	32,200
N	12.97	50,600	12.05	44,000	11.34	39,300	10.74	35,500	10.34	33,100	10.17	32,100
4	12.87	49,800	11.91	43,100	11.21	38,500	10.67	35,100	10.28	32,800	10.12	31,800
8	12.75	49,000	11.76	42,000	11.09	37,700	10.57	34,500	10.23	32,500	10.04	31,300
12	12.57	47,700	11.65	41,300	10.99	37,000	10.48	34,000	10.20	32,300	9.97	30,900
	June 16		June 17		June 18		June 19		June 20		June 21	
4	9.93	30,700	10.08	31,600	10.55	34,400	10.02	31,200	9.42	27,900	9.08	26,100
8	9.90	30,600	10.22	32,400	10.46	33,900	9.90	30,600	9.32	27,400	9.07	26,000
N	9.87	30,400	10.41	33,600	10.43	33,700	9.81	30,100	9.26	27,000	9.06	26,000
4	9.89	30,500	10.64	34,900	10.32	33,000	9.72	29,600	9.18	26,600	9.03	25,800
8	9.92	30,700	10.70	35,300	10.22	32,400	9.60	28,900	9.11	26,200	8.99	25,600
12	10.00	31,100	10.66	35,100	10.13	31,900	9.49	28,300	9.07	26,000	9.96	25,500

Supplemental record.- May 23, 9 a.m., 19.08 ft., 102,000 sec.-ft.

## Flathead Lake at Somers, Mont.

Location.- Lat. 48°04', long. 114°13', in NE¼ sec. 26, T. 27 N., R. 21 W., at steamboat dock at Somers. Datum of gage is at mean sea level (Somers datum).

Drainage area.- 6,990 square miles.

Gage-height record.- Water-stage recorder graph except July 10-11, which was computed on basis of graph through twice-daily staff-gage readings. Elevations at 12 p.m. used to determine contents.

Maxima.- May-June 1948: Contents, 2,175,000 acre-feet 6 to 7 p.m. June 6 (elevation, 2,896.01 feet).

1922 to April 1948: Contents, 2,208,000 acre-feet June 19, 1933 (elevation, 2,896.26 feet).

Remarks.- Since April 1938 elevation has been subject to regulation by Kerr Dam, 4 miles below outlet. No major regulation May 1 to June 29, 1948. Slight diversion and regulation above Flathead Lake.

Elevation, in feet, and contents, in acre-feet, at 12 p.m. of indicated day

Day	May		June		July	
	Elevation	Acre-feet	Elevation	Acre-feet	Elevation	Acre-feet
1	2,886.36	973,800	2,895.47	2,106,000	2,891.41	1,592,000
2	2,886.57	999,100	g2,895.50	2,110,000	2,891.67	1,624,000
3	2,886.78	1,024,000	2,895.66	2,130,000	2,891.89	1,651,000
4	2,886.87	1,035,000	2,895.80	2,148,000	2,892.05	1,671,000
5	2,886.97	1,047,000	2,895.96	2,169,000	2,892.24	1,695,000
6	2,887.03	1,055,000	2,896.00	2,174,000	2,892.42	1,718,000
7	2,887.21	1,076,000	2,895.97	2,170,000	2,892.56	1,736,000
8	2,887.39	1,098,000	2,895.94	2,166,000	2,892.68	1,751,000
9	2,887.54	1,116,000	2,895.88	2,159,000	2,892.82	1,768,000
10	2,887.66	1,131,000	2,895.74	2,140,000	2,892.94	1,783,000
11	2,887.76	1,143,000	2,895.63	2,126,000	g2,892.95	1,785,000
12	2,887.81	1,149,000	2,895.39	2,095,000	2,892.93	1,782,000
13	2,887.87	1,156,000	2,895.11	2,059,000	2,892.89	1,777,000
14	2,887.96	1,167,000	2,894.81	2,021,000	2,892.83	1,770,000
15	2,888.00	1,172,000	2,894.45	1,975,000	2,892.81	1,767,000
16	2,888.03	1,176,000	2,894.14	1,935,000	2,892.85	1,772,000
17	2,888.10	1,184,000	2,893.85	1,898,000	2,892.90	1,778,000
18	2,888.26	1,204,000	2,893.59	1,865,000	2,892.90	1,778,000
19	2,888.69	1,256,000	2,893.34	1,834,000	2,892.97	1,787,000
20	2,889.29	1,330,000	2,893.09	1,802,000	2,893.02	1,794,000
21	2,889.93	1,408,000	2,892.81	1,767,000	2,892.94	1,783,000
22	2,890.69	1,503,000	2,892.54	1,733,000	2,892.86	1,773,000
23	2,891.56	1,610,000	2,892.25	1,696,000	2,892.82	1,768,000
24	2,892.39	1,714,000	2,892.01	1,666,000	2,892.82	1,768,000
25	2,893.01	1,792,000	2,891.78	1,638,000	2,892.85	1,772,000
26	2,893.50	1,854,000	2,891.54	1,608,000	2,892.85	1,772,000
27	2,894.00	1,917,000	2,891.32	1,581,000	2,892.98	1,788,000
28	2,894.52	1,984,000	2,891.09	1,552,000	2,892.98	1,788,000
29	2,894.99	2,044,000	2,890.90	1,529,000	2,892.87	1,775,000
30	2,895.30	2,084,000	2,891.10	1,553,000	2,892.80	1,766,000
31	2,895.43	2,100,000			2,892.77	1,762,000
Change in contents, acre-feet		+1,161,000		-547,000		+209,000

g Graph based on observer's twice-daily readings.

## Flathead River near Polson, Mont.

**Location.**- Lat. 47°41', long. 114°15', in NW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 11, T. 22 N., R. 21 W., half a mile downstream from Kerr Dam and 6 miles downstream from Polson.

**Drainage area.**- 6,990 square miles.

**Gage-height record.**- Water-stage recorder graph.

**Discharge record.**- Stage-discharge relation defined by current-meter measurements below 71,200 second-feet and extended to peak stage. Gage heights used to hundredths.

**Maxima.**- May-June 1948: Discharge, 73,200 second-feet 10 a.m. June 6 (gage height, 19.15 feet).

1907 to April 1948: Discharge, 82,100 second-feet May 29, 30, 1928 (gage height, 17.1 feet, site and datum then in use).

**Remarks.**- Several small diversions from tributaries above Flathead Lake. Flow regulated since April 1938 by Flathead Lake. Numerous small fluctuations caused by power plant half a mile upstream not shown in detail in table of gage height and discharge at indicated time.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	17,000	70,200	4,400	11	24,700	69,800	9,380	21	34,600	51,200	15,300
2	18,500	70,400	4,420	12	25,100	68,300	14,100	22	38,200	49,600	15,200
3	19,300	70,900	5,050	13	25,100	66,600	14,700	23	42,500	48,200	13,400
4	19,800	71,800	5,530	14	25,400	64,300	14,600	24	47,600	47,200	8,550
5	20,700	72,400	5,920	15	26,200	62,200	11,900	25	52,200	45,700	6,840
6	21,000	72,700	6,320	16	26,500	59,800	7,140	26	55,500	44,800	6,960
7	21,500	72,400	6,630	17	26,800	58,000	6,790	27	58,800	42,900	6,960
8	22,400	71,500	6,840	18	27,400	56,400	7,780	28	62,200	41,000	10,800
9	23,600	71,300	4,830	19	29,200	54,600	8,080	29	65,200	34,600	14,600
10	24,300	71,000	5,630	20	31,600	52,700	12,700	30	67,900	12,500	16,200
								31	69,500		15,800
Monthly mean discharge, in second-feet.....									34,530	58,170	9,463
Runoff, in inches.....									5.70	9.29	1.56

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	11.11	26,700	11.17	26,900	11.45	28,200	11.90	30,300	12.66	33,400	13.25	36,800
8	11.15	26,900	11.28	27,400	11.70	29,400	12.13	31,400	12.70	34,100	13.56	38,400
N	11.14	26,800	11.26	27,400	11.62	29,000	12.24	31,900	12.61	34,600	13.52	38,200
4	11.13	26,800	11.28	27,400	11.70	29,400	12.27	32,100	12.91	35,200	13.66	38,900
8	11.16	26,900	11.34	27,700	11.90	30,300	12.36	32,500	13.04	35,800	13.72	39,200
12	11.20	27,100	11.40	28,000	11.89	30,300	12.51	33,200	13.13	36,200	13.80	39,600
	May 23		May 24		May 25		May 26		May 27		May 28	
4	14.02	40,800	14.89	45,600	15.76	50,800	16.32	54,100	16.82	57,300	17.35	60,800
8	14.23	42,000	15.10	46,800	15.90	51,600	16.44	54,900	16.94	58,100	17.47	61,600
N	14.30	42,400	15.28	47,900	16.02	52,300	16.54	55,500	17.03	58,700	17.57	62,200
4	14.49	43,400	15.43	48,800	16.12	52,900	16.63	56,100	17.17	59,600	17.65	62,700
8	14.64	44,200	15.53	49,400	16.19	53,300	16.73	56,700	17.29	60,400	17.77	63,500
12	14.76	44,900	15.69	50,300	16.28	53,900	16.79	57,100	17.34	60,700	17.79	63,300
	May 29		May 30		May 31		June 1		June 2		June 3	
4	17.60	63,700	18.28	67,100	18.58	69,200	18.67	69,800	18.70	70,000	18.76	70,400
8	17.98	65,000	18.33	67,400	18.67	69,800	18.74	70,300	18.80	70,700	18.85	71,000
N	18.00	65,100	18.42	68,000	18.63	69,500	18.75	70,400	18.79	70,600	18.83	70,900
4	18.12	65,900	18.48	68,500	18.66	69,700	18.74	70,300	18.74	70,300	18.87	71,200
8	18.20	66,500	18.49	68,500	18.63	69,500	18.74	70,300	18.82	70,800	18.86	71,100
12	18.27	67,000	18.57	69,100	18.63	69,500	18.77	70,500	18.72	70,100	18.88	71,300
	June 4		June 5		June 6		June 7		June 8		June 9	
4	18.92	71,500	19.02	72,200	19.10	72,800	19.04	72,400	18.96	71,800	18.86	71,100
8	18.95	71,800	19.04	72,400	19.10	72,800	19.07	72,600	18.95	71,800	18.90	71,400
N	18.96	71,800	19.03	72,300	19.08	72,700	19.08	72,700	18.92	71,500	18.83	71,600
4	18.98	72,000	19.06	72,500	19.06	72,500	19.06	72,500	18.86	71,100	18.90	71,400
8	19.00	72,100	19.08	72,700	19.06	72,500	19.00	72,100	18.84	71,000	18.87	71,200
12	19.03	72,300	19.08	72,700	19.06	72,500	18.99	72,000	18.88	71,300	18.87	71,200
	June 10		June 11		June 12		June 13		June 14		June 15	
4	18.85	71,000	18.75	70,400	18.51	68,700	18.28	67,100	17.90	64,400	17.61	62,500
8	18.91	71,500	18.72	70,100	18.47	68,400	18.31	67,300	17.99	65,000	17.68	62,900
N	18.84	71,000	18.68	69,700	18.48	68,500	18.21	66,600	17.94	64,700	17.55	62,100
4	18.83	70,900	18.63	69,500	18.43	68,100	18.17	66,300	17.86	64,100	17.57	62,200
8	18.78	70,600	18.60	69,300	18.41	68,000	18.09	65,700	17.77	63,500	17.43	61,300
12	18.75	70,400	18.42	68,000	18.38	67,800	18.04	65,400	17.72	63,200	17.42	61,200
	June 16		June 17		June 18		June 19		June 20		June 21	
4	17.26	60,200	16.99	58,400	16.69	56,500	16.46	55,000	16.18	53,300	15.89	51,500
8	17.26	60,200	17.05	58,800	16.73	56,700	16.48	55,100	16.14	53,000	15.95	51,900
N	17.23	60,000	16.92	58,000	16.70	56,600	16.40	54,600	16.08	52,700	15.85	51,300
4	17.10	59,200	16.90	57,800	16.67	56,400	16.34	54,200	16.04	52,400	15.79	50,900
8	17.13	59,300	16.82	57,300	16.59	55,800	16.31	54,100	16.03	52,400	15.71	50,500
12	17.06	58,900	16.76	57,000	16.54	55,500	16.17	53,200	15.92	51,700	15.68	50,300

**Supplemental record.**- May 17, 2 a.m., 11.08 ft., 26,600 sec.-ft.; May 18, 2 a.m., 11.12 ft., 26,700 sec.-ft., 6 a.m., 11.18 ft., 27,000 sec.-ft.; May 19, 6 a.m., 11.53 ft., 28,600 sec.-ft.; May 20, 6 a.m., 11.92 ft., 30,400 sec.-ft.; May 22, 6 a.m., 13.28 ft., 37,000 sec.-ft.; May 24, 2 a.m., 14.77 ft., 44,900 sec.-ft., 6 a.m., 14.97 ft., 46,000 sec.-ft.; June 6, 10 a.m., 19.15 ft., 73,200 sec.-ft.; June 11, 10 p.m., 18.61 ft., 69,400 sec.-ft.

## Middle Fork Flathead River at Essex, Mont.

Location.- Lat. 48°16', long. 113°36', in SW $\frac{1}{4}$  sec. 14, T. 29 N., R. 16 W., 0.6 mile upstream from Ole Creek, 0.7 mile southeast of Essex, and 4 miles downstream from Bear Creek.

Drainage area.- 517 square miles.

Gage-height record.- Water-stage recorder graph except for period 8 a.m. May 20 to 5 p.m. May 22 for which a graph was drawn based on fragmentary record and daily staff-gage readings and for period July 18 to 20.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 9,400 second-feet and extended to peak stage. Gage heights used to hundredths. Discharge interpolated July 18-20.

Maxima.- May-June 1948: Discharge, 14,500 second-feet 8 p.m. May 22 (gage height, 10.95 feet, from partly estimated gage-height record).

1939 to April 1948: Discharge, 9,800 second-feet June 18, 1943 (gage height, 9.45 feet).

Remarks.- Flood flow not affected by storage or diversion.

## Mean discharge, in second-feet, 1948

mean discharges, in second-feet, 1946											
Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2,760	7,600	1,730	11	2,070	4,280	895	21	9,390	2,850	640
2	2,290	7,800	1,590	12	1,920	3,870	847	22	13,600	2,760	594
3	2,060	8,260	1,450	13	2,260	3,470	808	23	12,000	2,680	566
4	2,120	8,870	1,350	14	2,560	3,190	762	24	9,020	2,580	550
5	1,930	7,850	1,270	15	2,350	3,110	730	25	9,020	2,500	525
6	1,940	7,050	1,190	16	2,530	3,210	712	26	9,730	2,360	505
7	2,280	6,760	1,120	17	3,430	4,360	676	27	10,300	2,220	492
8	2,820	6,570	1,040	18	6,080	4,100	680	28	9,460	2,100	540
9	2,790	6,110	982	19	8,190	3,460	680	29	7,980	2,000	588
10	2,360	5,120	930	20	8,820	3,030	800	30	6,740	1,850	577
								31	6,840		515
Monthly mean discharge, in second-feet .....									5,408	4,399	849
Runoff, in inches .....									12.11	9.50	1.89

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	5.77	3,000	7.31	5,580	8.53	8,110	8.66	8,410	8.88	8,910	10.40	12,900
8	5.89	3,170	7.50	5,940	8.66	8,410	8.77	8,660	8.90	8,960	10.53	13,500
N	5.96	3,270	7.52	5,980	8.67	8,430	8.9	8,960	8.88	8,910	10.58	13,400
4	6.08	3,450	7.61	6,160	8.58	8,220	9.0	9,200	9.00	9,200	10.81	14,100
8	6.38	3,930	7.86	6,670	8.54	8,130	8.97	9,130	9.34	10,000	10.95	14,500
12	6.66	4,750	8.25	7,490	8.56	8,220	8.89	8,940	10.0	11,800	10.90	14,400
	May 23		May 24		May 25		May 26		May 27		May 28	
4	10.69	13,700	9.23	9,750	8.97	9,130	9.37	10,100	9.62	10,800	9.39	10,200
8	10.38	12,800	9.03	9,270	8.95	9,080	9.32	9,970	9.60	10,700	9.32	9,970
N	10.00	11,800	8.82	8,780	8.86	8,870	9.16	9,580	9.46	10,300	9.11	9,460
4	9.73	11,000	8.68	8,450	8.79	8,710	9.03	9,270	9.33	10,000	8.95	9,080
8	9.48	10,400	8.67	8,430	8.95	9,080	9.13	9,510	9.33	10,000	8.82	8,780
12	9.38	10,100	8.82	8,780	9.21	9,700	9.42	10,200	9.32	9,970	8.72	8,550
	May 29		May 30		May 31		June 1		June 2		June 3	
4	8.65	8,380	8.08	7,130	7.94	6,830	8.37	7,750	8.55	8,160	8.57	8,200
8	8.57	8,200	7.95	6,860	7.95	6,860	8.36	7,730	8.48	8,000	8.56	8,180
N	8.48	8,000	7.84	6,620	7.90	6,750	8.28	7,560	8.33	7,670	8.52	8,090
4	8.38	7,780	7.72	6,580	7.88	6,710	8.17	7,320	8.24	7,470	8.58	8,220
8	8.29	7,580	7.74	6,420	7.97	6,903	8.28	7,560	8.28	7,560	8.68	8,450
12	8.20	7,380	7.84	6,620	8.20	7,380	8.45	7,930	8.43	7,890	8.91	8,980
	June 4		June 5		June 6		June 7		June 8		June 9	
4	9.07	9,370	8.56	8,180	8.22	7,420	8.02	7,000	7.99	6,940	7.80	6,540
8	9.02	9,250	8.54	8,130	8.12	7,210	7.94	6,830	7.89	6,730	7.69	6,320
N	8.85	8,840	8.41	7,840	7.99	6,940	7.83	6,600	7.75	6,440	7.58	6,100
4	8.74	8,590	8.29	7,580	7.91	6,770	7.78	6,500	7.66	6,260	7.49	5,920
8	8.71	8,520	8.25	7,490	7.91	6,770	7.87	6,690	7.69	6,320	7.39	5,730
12	8.63	8,340	8.23	7,450	7.99	6,940	7.98	6,920	7.79	6,520	7.32	5,600
	June 10		June 11		June 12		June 13		June 14		June 15	
4	7.25	5,460	6.67	4,420	6.46	4,060	6.17	3,590	5.96	3,270	5.90	3,180
8	7.17	5,310	6.62	4,330	6.40	3,960	6.14	3,540	5.93	3,220	5.89	3,170
N	7.09	5,160	6.58	4,270	6.34	3,860	6.10	3,480	5.90	3,180	5.83	3,080
4	6.97	4,950	6.53	4,180	6.27	3,750	6.05	3,400	5.86	3,120	5.80	3,040
8	6.87	4,770	6.51	4,150	6.23	3,690	6.01	3,340	5.86	3,120	5.80	3,040
12	6.76	4,570	6.50	4,130	6.20	3,640	5.98	3,300	5.89	3,170	5.83	3,080
	June 16		June 17		June 18		June 19		June 20		June 21	
4	5.84	3,100	6.31	3,820	6.83	4,350	6.20	3,640	5.86	3,120	5.71	2,910
8	5.85	3,110	6.63	4,350	6.55	4,220	6.14	3,540	5.82	3,070	5.71	2,910
N	5.90	3,180	6.84	4,710	6.48	4,100	6.08	3,450	5.78	3,010	5.68	2,870
4	5.94	3,240	6.85	4,730	6.40	3,960	6.02	3,360	5.74	2,960	5.62	2,790
8	6.04	3,390	6.78	4,610	6.33	3,850	5.96	3,270	5.73	2,940	5.61	2,770
12	6.04	3,390	6.70	4,470	6.26	3,740	5.91	3,200	5.71	2,910	5.62	2,790

Supplemental record.- June 17, 2 p.m., 6.87 ft., 4,770 sec.-ft.

## Middle Fork Flathead River near Belton, Mont.

Location.- Lat. 48°29'50", long. 114°00'30", in NE¼ sec. 34, T. 32 N., R. 19 W., three-quarters of a mile downstream from McDonald Creek, 1½ miles west of Belton, and 3½ miles upstream from mouth.

Drainage area.- 1,140 square miles.

Gage-height record.- Graph drawn on basis of once-daily staff-gage readings, comparison with other Flathead River stations, and crest gage height obtained from floodmark.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 20,500 second-feet and extended to peak stage. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 32,600 second-feet 4 p.m. May 23 (gage height, 12.40 feet, from floodmark).

1939 to April 1948: Discharge observed, 20,600 second-feet June 18, 1943 (gage height, 9.00 feet).

Remarks.- No regulation or diversion.

## Mean discharge, in second-feet, 1948

Monthly mean discharge, in second-feet, 1940											
Day	May	June	July	Day	May	June	July	Day	May	June	July
1	7,340	16,800	5,920	11	5,840	13,300	3,120	21	20,800	8,750	2,320
2	6,400	18,300	5,670	12	5,560	11,500	2,890	22	26,200	8,760	2,170
3	5,870	19,000	5,390	13	5,920	9,710	2,690	23	31,800	8,700	2,120
4	5,760	20,800	5,030	14	6,890	9,300	2,500	24	26,200	8,360	2,020
5	5,420	18,500	4,560	15	6,860	9,370	2,330	25	22,800	8,170	1,880
6	5,250	16,700	4,270	16	6,680	9,480	2,280	26	24,200	7,770	1,820
7	5,730	16,500	4,020	17	7,670	10,900	2,260	27	25,200	7,220	1,820
8	6,950	16,900	3,740	18	11,800	10,900	2,170	28	24,300	6,680	1,860
9	7,400	16,700	3,490	19	16,400	9,880	2,120	29	21,900	6,270	2,150
10	6,680	14,900	3,250	20	19,700	9,210	2,170	30	17,900	6,100	2,250
								31	16,000		2,120
Monthly mean discharge, in second-feet.....									13,340	11,850	2,981
Runoff, in inches.....									13.49	11.60	3.01

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	4.90	6,860	5.72	9,400	7.21	14,200	8.55	18,700	9.30	21,200	9.50	22,000
8	4.98	7,100	6.20	10,900	7.57	15,400	8.67	19,100	9.23	21,000	10.00	23,800
N	5.14	7,580	6.67	12,400	7.95	16,600	8.83	19,600	9.13	20,600	10.80	26,600
4	5.32	8,140	6.93	13,300	8.30	17,800	9.00	20,200	9.05	20,400	11.50	29,200
8	5.46	8,580	7.02	13,600	8.49	18,500	9.19	20,800	9.08	20,500	11.77	30,200
12	5.52	8,760	7.06	13,700	8.50	18,500	9.27	21,100	9.18	20,800	11.84	30,500
	May 23		May 24		May 25		May 26		May 27		May 28	
4	12.12	31,600	11.40	28,800	9.54	22,100	9.64	22,500	10.00	23,800	10.20	24,500
8	12.30	32,200	11.10	27,700	9.65	22,500	9.90	23,400	10.12	24,200	10.08	24,000
N	12.30	32,200	10.71	26,300	9.93	23,500	10.27	24,700	10.50	25,600	10.10	24,100
4	12.40	32,600	10.22	24,600	9.99	23,700	10.50	25,600	10.75	26,500	10.13	24,203
8	12.15	31,700	9.90	23,400	9.73	22,800	10.42	25,300	10.69	26,200	10.14	24,300
12	11.72	30,000	9.68	22,600	9.60	22,300	10.23	24,600	10.50	25,600	10.00	23,800
	May 29		May 30		May 31		June 1		June 2		June 3	
4	9.78	23,000	8.97	20,100	7.64	15,600	7.68	15,700	8.21	17,500	8.49	18,500
8	9.61	22,400	8.66	19,000	7.70	15,800	7.80	16,100	8.40	18,200	8.67	19,100
N	9.48	21,900	8.28	17,800	7.80	16,100	8.10	17,100	8.57	18,700	8.71	19,200
4	9.34	21,400	7.92	16,500	7.83	16,200	8.30	17,800	8.58	18,800	8.72	19,200
8	9.18	20,800	7.70	15,800	7.83	16,200	8.26	17,700	8.50	18,500	8.71	19,200
12	9.05	20,400	7.63	15,600	7.75	16,000	8.17	17,400	8.44	18,300	8.67	19,100
	June 4		June 5		June 6		June 7		June 8		June 9	
4	8.80	19,500	8.84	19,700	8.00	16,800	7.76	16,000	7.90	16,500	7.96	16,700
8	9.10	20,500	8.55	18,700	8.00	16,800	7.80	16,100	7.96	16,703	7.99	16,800
N	9.38	21,500	8.42	18,200	7.97	16,700	7.98	16,700	8.17	17,400	8.07	17,000
4	9.50	22,000	8.35	18,000	7.94	16,600	8.06	17,000	8.12	17,200	8.00	16,800
8	9.38	21,500	8.26	17,700	7.90	16,500	8.00	16,800	8.04	16,900	7.88	16,400
12	9.10	20,500	8.13	17,200	7.85	16,300	7.92	16,500	7.98	16,700	7.75	16,000
	June 10		June 11		June 12		June 13		June 14		June 15	
4	7.50	15,200	7.00	13,500	6.50	11,900	5.80	9,660	5.70	9,340	5.70	9,340
N	7.30	14,500	6.86	13,100	6.29	11,200	5.76	9,530	5.67	9,240	5.75	9,500
4	7.15	14,000	6.69	12,500	6.02	10,400	5.74	9,470	5.65	9,180	5.70	9,340
	June 16		June 17		June 18		June 19		June 20		June 21	
4	5.70	9,340	6.00	10,300	6.27	11,200	5.89	9,950	5.69	9,310	5.50	8,700
N	5.75	9,500	6.30	11,300	6.09	10,600	5.83	9,760	5.63	9,120	5.51	8,730
4	5.87	9,880	6.45	11,700	5.99	10,300	5.77	9,560	5.54	8,830	5.53	8,800



## Bear Creek near Essex, Mont.

Location.- Water-stage recorder, lat. 48°16'50", long. 113°25'30", near south line of sec. 7, T. 29 N., R. 14 W., 0.8 mile downstream from Autumn Creek and  $8\frac{1}{2}$  miles north-east of Essex.

Drainage area.- 20.7 square miles.

Gage-height record.- Water-stage recorder graph except for periods May 23 to 1 p.m. May 24, 2 p.m. to 12 p.m. June 5, 1 a.m. to 5 a.m. June 8, 7 p.m. July 4 to 9 a.m. July 5, when gage heights were estimated on basis of records for Skyland Creek near Essex.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 300 second-feet and extended to peak stage. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 696 second-feet 1:30 p.m. May 22 (gage height, 3.01 feet).

1946 to April 1948: Discharge, 623 second-feet May 2, 1947 (gage height, 2.87 feet).

Remarks.- No diversion or regulation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	99	267	65	11	83	155	35	21	363	133	26
2	88	268	60	12	84	150	34	22	519	127	26
3	84	308	57	13	99	132	31	23	420	118	25
4	83	351	53	14	95	116	29	24	314	116	24
5	80	290	50	15	95	114	29	25	326	109	22
6	87	245	44	16	110	165	29	26	349	99	21
7	103	222	43	17	164	262	28	27	368	91	21
8	118	201	40	18	264	214	28	28	319	84	24
9	106	182	37	19	309	177	27	29	281	79	26
10	91	160	37	20	304	150	28	30	254	74	23
								31	257		21
Monthly mean discharge, in second-feet .....									204	172	33.6
Runoff, in inches .....									11.37	9.27	1.87

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height		Discharge		Gage height		Discharge		Gage height		Discharge		Gage height		Discharge		
	May 17		May 18		May 19		May 20		May 21		May 22		May 23		May 24		
4	1.45	134	1.82	221	2.18	324	2.16	318	2.08	292	2.48	438	2.48	438	2.48	438	
8	1.43	129	1.80	216	2.14	311	2.12	305	2.08	292	2.48	438	2.48	438	2.48	438	
N	1.42	127	1.81	219	2.09	295	2.10	298	2.14	311	2.91	643	2.91	643	2.91	643	
4	1.70	191	2.13	308	2.10	298	2.10	298	2.48	438	2.75	562	2.75	562	2.75	562	
8	1.84	226	2.21	334	2.11	301	2.10	298	2.56	473	2.71	543	2.71	543	2.71	543	
12	1.83	224	2.20	331	2.17	321	2.09	295	2.51	451	2.68	528	2.68	528	2.68	528	
May 23		May 24		May 25		May 26		May 27		May 28		May 29		May 30		May 31	
4	2.57	478	2.20	331	2.15	314	2.22	338	2.34	382	2.22	338	2.22	338	2.22	338	
8	2.48	438	2.11	301	2.08	292	2.19	328	2.28	360	2.18	324	2.18	324	2.18	324	
N	2.40	405	2.03	278	2.06	286	2.16	318	2.28	360	2.16	318	2.16	318	2.16	318	
4	2.34	382	2.12	305	2.20	331	2.28	360	2.30	367	2.14	311	2.14	311	2.14	311	
8	2.32	375	2.19	328	2.34	382	2.31	371	2.30	367	2.11	301	2.11	301	2.11	301	
12	2.28	360	2.19	328	2.32	375	2.35	386	2.26	352	2.07	289	2.07	289	2.07	289	
May 29		May 30		May 31		June 1		June 2		June 3		June 4		June 5		June 6	
4	2.06	286	1.95	256	1.95	256	2.00	269	2.00	269	1.99	266	1.99	266	1.99	266	
8	2.02	275	1.90	242	1.91	245	1.95	256	1.96	258	2.01	272	2.01	272	2.01	272	
N	2.03	278	1.88	237	1.89	239	1.92	248	1.93	250	2.15	314	2.15	314	2.15	314	
4	2.06	286	1.95	256	1.96	258	2.00	269	2.00	269	2.21	334	2.21	334	2.21	334	
8	2.04	281	2.00	269	2.02	275	2.05	283	2.05	283	2.22	338	2.22	338	2.22	338	
12	2.00	269	1.99	266	2.01	272	2.03	278	2.02	275	2.35	386	2.35	386	2.35	386	
June 4		June 5		June 6		June 7		June 8		June 9		June 10		June 11		June 12	
4	2.33	378	2.13	308	1.94	253	1.84	226	1.77	208	1.70	191	1.70	191	1.70	191	
8	2.28	360	2.08	292	1.91	245	1.81	219	1.73	198	1.68	186	1.68	186	1.68	186	
N	2.26	352	2.07	289	1.88	237	1.80	216	1.71	194	1.66	181	1.66	181	1.66	181	
4	2.24	345	2.05	283	1.90	242	1.82	221	1.73	198	1.66	181	1.66	181	1.66	181	
8	2.18	324	2.02	275	1.90	242	1.83	224	1.74	201	1.63	174	1.63	174	1.63	174	
12	2.18	324	1.98	264	1.88	237	1.81	219	1.71	194	1.61	169	1.61	169	1.61	169	
June 10		June 11		June 12		June 13		June 14		June 15		June 16		June 17		June 18	
4	1.50	167	1.51	146	1.57	160	1.47	138	1.38	120	1.33	111	1.33	111	1.33	111	
8	1.59	165	1.53	151	1.53	151	1.47	138	1.37	118	1.32	109	1.32	109	1.32	109	
N	1.58	152	1.56	158	1.51	143	1.45	134	1.36	116	1.32	109	1.32	109	1.32	109	
4	1.55	156	1.53	151	1.50	144	1.42	127	1.35	114	1.33	111	1.33	111	1.33	111	
8	1.54	153	1.59	165	1.49	142	1.41	125	1.35	114	1.42	127	1.42	127	1.42	127	
12	1.52	149	1.60	167	1.48	140	1.40	123	1.34	113	1.41	125	1.41	125	1.41	125	
June 16		June 17		June 18		June 19		June 20		June 21		June 22		June 23		June 24	
4	1.42	127	2.06	286	1.85	229	1.70	191	1.56	158	1.46	136	1.46	136	1.46	136	
8	1.60	167	2.05	283	1.82	221	1.66	181	1.54	153	1.44	131	1.44	131	1.44	131	
N	1.67	184	2.00	269	1.78	211	1.64	177	1.55	156	1.43	127	1.43	127	1.43	127	
4	1.63	174	1.98	264	1.75	204	1.61	169	1.50	144	1.42	127	1.42	127	1.42	127	
8	1.66	181	1.94	253	1.73	198	1.59	165	1.49	142	1.46	136	1.46	136	1.46	136	
12	1.69	189	1.89	239	1.72	196	1.58	162	1.47	138	1.52	149	1.52	149	1.52	149	

Supplemental record.- May 18, 2 p.m., 1.98 ft., 264 sec.-ft., 6 p.m., 2.22 ft., 338 sec.-ft.; May 21, 2 p.m., 2.27 ft., 356 sec.-ft., 6 p.m., 2.56 ft., 473 sec.-ft.; May 22, 10 a.m., 2.51 ft., 451 sec.-ft., 1:30 p.m., 3.01 ft., 696 sec.-ft., 2 p.m., 2.99 ft., 686 sec.-ft.; June 3, 10 p.m., 2.23 ft., 342 sec.-ft.; June 4, 6 p.m., 2.17 ft., 321 sec.-ft.; June 17, 2 a.m., 1.84 ft., 226 sec.-ft., 6 a.m., 2.11 ft., 301 sec.-ft.

## Skyland Creek near Essex, Mont.

Location.- Lat. 48°17'30", long. 113°23'20", in NW<sup>1</sup> sec. 9, T. 29 N., R. 14 W., 150 feet upstream from mouth and 10 miles northeast of Essex.

Drainage area.- 8.09 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge, 284 second-feet 1 p.m. May 22 (gage height, 2.15 feet).

1946 to April 1948: Discharge, 189 second-feet May 9, 1947 (gage height, 1.84 feet).

Remarks.- Flood flow not affected by storage or diversion.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	14	137	28	11	15	77	19	21	11	64	14
2	13	142	27	12	14	73	17	22	209	56	14
3	13	166	26	13	15	64	17	23	176	49	13
4	13	185	24	14	16	56	16	24	140	45	13
5	12	162	22	15	16	56	16	25	172	42	13
6	13	130	22	16	19	78	16	26	199	58	13
7	15	114	21	17	53	131	15	27	197	55	13
8	20	104	20	18	62	109	15	28	139	33	14
9	19	99	20	19	83	87	15	29	116	31	14
10	17	84	19	20	92	75	15	30	120	30	13
								31	123		12
Monthly mean discharge, in second-feet.....									71.5	85.1	17.3
Runoff, in inches.....									10.19	11.72	2.47

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	.92	25	1.23	54	1.48	82	1.57	94	1.53	88	1.88	173
8	.92	25	1.23	54	1.48	82	1.57	94	1.53	88	1.82	152
N	.93	26	1.23	54	1.48	82	1.56	92	1.56	92	2.03	235
4	1.05	36	1.33	64	1.49	83	1.55	91	1.72	123	2.12	271
8	1.17	48	1.45	78	1.51	85	1.55	91	1.82	152	2.00	220
12	1.21	52	1.46	79	1.56	92	1.55	91	1.87	170	1.99	216
	May 23		May 24		May 25		May 26		May 27		May 28	
4	1.92	188	1.77	137	1.79	142	1.96	204	1.97	208	1.84	159
8	1.92	188	1.73	126	1.77	137	1.90	180	1.97	208	1.81	148
N	1.87	170	1.71	121	1.82	152	1.88	173	1.95	200	1.76	134
4	1.85	162	1.78	140	1.95	200	1.98	212	1.95	200	1.74	126
8	1.85	162	1.84	159	2.00	220	1.98	212	1.89	176	1.74	126
12	1.83	156	1.84	159	1.98	212	1.98	212	1.86	166	1.71	116
	May 29		May 30		May 31		June 1		June 2		June 3	
4	1.71	115	1.75	122	1.74	120	1.82	135	1.85	140	1.85	140
8	1.71	115	1.73	118	1.72	117	1.78	127	1.84	139	1.87	144
N	1.71	115	1.70	113	1.70	113	1.78	127	1.79	129	2.03	175
4	1.72	117	1.74	120	1.77	126	1.86	142	1.88	146	2.09	187
8	1.73	118	1.76	124	1.82	135	1.91	152	1.92	154	2.06	181
12	1.71	115	1.75	122	1.82	135	1.88	146	1.86	142	2.15	199
	June 4		June 5		June 6		June 7		June 8		June 9	
4	2.07	183	1.99	167	1.84	139	1.72	117	1.66	106	1.62	99
8	2.05	179	1.94	158	1.79	129	1.69	111	1.65	104	1.60	96
N	2.12	193	1.96	161	1.77	126	1.68	110	1.62	99	1.63	101
4	2.05	179	1.97	163	1.77	126	1.72	117	1.64	103	1.63	101
8	2.07	183	1.94	158	1.79	129	1.71	115	1.66	106	1.60	96
12	2.05	179	1.87	144	1.75	122	1.69	111	1.64	103	1.58	93
	June 10		June 11		June 12		June 13		June 14		June 15	
4	1.57	91	1.49	77	1.48	76	1.43	68	1.36	58	1.32	53
8	1.54	86	1.49	77	1.47	74	1.42	66	1.35	56	1.31	51
N	1.52	82	1.48	76	1.46	73	1.40	63	1.35	56	1.31	51
4	1.51	81	1.48	76	1.46	73	1.39	62	1.34	55	1.33	54
8	1.50	79	1.49	77	1.45	71	1.39	62	1.34	55	1.42	66
12	1.49	77	1.49	77	1.44	69	1.38	60	1.32	53	1.41	65
	June 16		June 17		June 18		June 19		June 20		June 21	
4	1.41	65	1.87	144	1.73	118	1.58	93	1.50	79	1.42	66
8	1.51	81	1.84	139	1.70	113	1.56	89	1.49	77	1.40	63
N	1.51	81	1.82	135	1.67	108	1.55	88	1.48	76	1.39	62
4	1.50	79	1.81	133	1.66	106	1.53	84	1.47	74	1.38	60
8	1.54	86	1.78	127	1.63	101	1.52	82	1.45	71	1.40	63
12	1.62	99	1.75	122	1.60	96	1.51	81	1.44	69	1.40	63

Supplemental record.- May 21, 2 p.m., 1.63 ft., 104 sec.-ft., 6 p.m., 1.80 ft., 145 sec.-ft.; May 22, 10 a.m., 1.90 ft., 180 sec.-ft., 1 p.m., 2.15 ft., 284 sec.-ft.; May 25, 10 a.m., 1.76 ft., 134 sec.-ft.; May 30, 3 a.m., 1.77 ft., 126 sec.-ft.; June 2, 6 p.m., 1.92 ft., 154 sec.-ft.; June 5, 2 a.m., 2.05 ft., 179 sec.-ft., 6 a.m., 2.00 ft., 169 sec.-ft.; June 9, 2 p.m., 1.65 ft., 104 sec.-ft.; June 14, 2 p.m., 1.36 ft., 58 sec.-ft.; June 16, 10 p.m., 1.53 ft., 84 sec.-ft.; June 21, 10 p.m., 1.42 ft., 66 sec.-ft.

## South Fork Flathead River near Columbia Falls, Mont.

Location.- Lat. 48°22', long. 114°03', in NE $\frac{1}{4}$  sec. 17, T. 30 N., R. 19 W., 2 miles upstream from mouth and 9 miles east of Columbia Falls. Datum of gage is 3,031.3 feet above mean sea level, datum of 1929 (Corps of Engineers bench mark).

Drainage area.- 1,640 square miles.

Gage-height record.- Graph based on staff-gage readings and shape of doubtful recorder graph except 8 p.m. May 20 to 8 a.m. May 22, 8 a.m. to noon May 25, 12 p.m. May 25 to noon May 29, noon June 1 to 4 a.m. June 5, for which water-stage recorder graph was used.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 30,700 second-feet and extended to peak stage. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 43,400 second-feet 12 p.m. May 22 (gage height, 19.60 feet, from floodmark).

1910-16, 1923 to April 1948: Discharge, 46,200 second-feet June 19, 1916 (gage height, 16.6 feet, site and datum then in use), from rating curve extended above 20,000 second-feet.

Remarks.- No regulation or diversion.

Mean discharge, in second-feet, 1948

mean discharge, in second-feet, 1948											
Day	May	June	July	Day	May	June	July	Day	May	June	July
1	10,200	24,400	5,820	11	8,390	18,700	2,890	21	31,800	8,720	2,320
2	8,430	25,700	5,440	12	7,790	15,800	2,790	22	40,800	8,470	2,110
3	7,390	27,100	4,930	13	8,730	14,000	2,640	23	38,900	8,670	1,980
4	7,610	31,200	4,510	14	9,910	13,000	2,540	24	29,700	8,790	1,920
5	7,050	27,100	4,200	15	9,150	12,400	2,400	25	28,500	8,510	1,840
6	6,980	23,900	3,920	16	8,790	11,800	2,330	26	30,900	7,710	1,730
7	8,310	23,100	3,700	17	10,600	12,500	2,240	27	33,100	7,160	1,700
8	10,900	23,300	3,500	18	17,100	11,600	2,160	28	33,200	6,700	1,890
9	11,100	22,800	3,240	19	24,100	10,000	2,130	29	28,500	6,440	2,320
10	9,330	20,900	3,060	20	27,600	9,010	2,380	30	23,800	6,260	2,240
								31	22,600		2,090
Monthly mean discharge, in second-feet									18,110	15,190	2,871
Runoff, in inches									12.68	10.33	2.02

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	8.41	9,370	10.60	14,400	13.63	22,200	15.05	26,500	16.22	30,600	18.36	38,400
8	8.68	9,930	11.28	16,100	14.15	23,800	15.23	27,100	16.38	31,100	18.73	39,900
N	8.92	10,500	11.85	17,500	14.38	24,400	15.35	27,500	16.45	31,400	19.10	41,400
4	9.15	11,000	12.30	18,600	14.60	25,100	15.47	27,900	16.57	31,800	19.41	42,600
8	9.47	11,700	12.59	19,400	14.71	25,400	15.70	28,800	16.95	33,100	19.48	42,900
12	9.92	12,700	13.09	20,600	14.88	25,300	15.98	29,700	17.58	35,300	19.60	43,400
	May 23		May 24		May 25		May 26		May 27		May 28	
4	19.36	42,400	16.66	32,100	15.55	28,200	16.19	30,500	16.86	32,800	17.22	34,100
8	18.95	40,800	16.15	30,300	15.66	28,600	16.43	31,300	17.10	33,600	17.22	34,100
N	18.53	39,100	15.77	29,000	15.66	28,600	16.43	31,300	17.09	33,600	17.08	33,600
4	18.05	37,200	15.50	28,000	15.60	28,400	16.35	31,000	16.97	33,200	16.85	32,800
8	17.62	35,500	15.43	27,800	15.64	28,500	16.35	31,000	16.92	33,000	16.61	31,900
12	17.15	33,800	15.46	27,900	15.82	29,200	16.52	31,600	17.05	33,500	16.42	31,300
	May 29		May 30		May 31		June 1		June 2		June 3	
4	16.20	30,500	14.50	24,800	13.76	22,600	14.21	23,900	14.77	25,600	15.00	26,300
8	15.95	29,600	14.26	24,100	13.74	22,500	14.42	24,900	14.89	26,000	15.14	26,800
N	15.68	28,700	14.09	23,600	13.70	22,400	14.47	24,700	14.86	25,900	15.24	27,000
4	15.36	27,600	13.92	23,100	13.70	22,400	14.43	24,600	14.78	25,600	15.27	27,200
8	15.04	26,400	13.83	22,800	13.75	22,600	14.45	24,600	14.76	25,600	15.41	27,700
12	14.77	25,600	13.78	22,600	14.00	23,300	14.62	25,200	14.85	25,800	15.82	29,200
	June 4		June 5		June 6		June 7		June 8		June 9	
4	16.28	30,800	15.81	29,100	14.43	25,600	13.96	23,200	14.12	23,700	14.00	23,300
8	16.58	31,800	15.50	28,000	14.33	24,300	14.02	23,400	14.18	23,800	14.00	23,300
N	16.64	32,000	15.17	26,900	14.16	23,800	13.96	23,200	14.08	23,500	13.94	23,100
4	16.55	31,700	14.88	25,900	13.98	23,200	13.88	22,900	13.91	23,000	13.80	22,700
8	16.35	31,000	14.65	25,200	13.85	22,800	13.87	22,900	13.83	22,800	13.63	22,200
12	16.11	30,200	14.50	24,800	13.86	22,900	13.98	23,200	13.86	22,900	13.42	21,600
	June 10		June 11		June 12		June 13		June 14		June 15	
4	13.29	21,200	12.75	19,800	11.51	16,700	10.59	14,400	10.13	13,200	9.83	12,500
8	13.25	21,000	12.53	19,200	11.34	16,200	10.51	14,200	10.12	13,200	9.81	12,500
N	13.22	21,000	12.34	18,800	11.15	15,800	10.45	14,000	10.08	13,100	9.83	12,500
4	13.18	20,800	12.06	18,000	10.97	15,300	10.38	13,800	10.00	12,900	9.77	12,400
8	13.06	20,600	11.86	17,600	10.83	15,000	10.29	13,600	9.92	12,700	9.70	12,200
12	12.95	20,300	11.69	17,100	10.71	14,700	10.19	13,400	9.86	12,600	9.65	12,100
	June 16		June 17		June 18		June 19		June 20		June 21	
4	9.59	12,000	9.59	12,000	9.70	12,200	8.92	10,500	8.37	9,290	8.07	8,690
8	9.55	11,900	9.74	12,300	9.55	11,900	8.81	10,200	8.30	9,150	8.07	8,690
N	9.53	11,800	9.94	12,800	9.39	11,500	8.71	10,000	8.21	8,970	8.12	8,790
4	9.48	11,700	10.09	13,100	9.26	11,200	8.64	9,840	8.14	8,830	8.11	8,770
8	9.46	11,700	9.99	12,900	9.14	11,000	8.55	9,650	8.09	8,730	8.08	8,710
12	9.47	11,700	9.84	12,500	9.02	10,700	8.46	9,470	8.07	8,690	8.06	8,670

Supplemental record.- May 18, 6 p.m., 12.55 ft., 19,300 sec.-ft.; May 19, 7 a.m., 14.15 ft., 23,800 sec.-ft.

## Stillwater River near Whitefish, Mont.

Location.- Lat. 48°19', long. 114°23', in SW $\frac{1}{4}$  sec. 34, T. 30 N., R. 22 W., 600 feet downstream from highway bridge, 7 miles southwest of Whitefish, and 10 miles upstream from Whitefish Creek.

Drainage area.- 529 square miles.

Gage-height record.- Water-stage recorder graph except noon May 23 to noon May 29, May 30, 31, which are based on floodmark, fragmentary gage-height record, and engineer's observations.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 3,640 second-feet, and extended to peak stage. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 4,330 second-feet about 4 p.m. May 26 (gage height, 20.90 feet, from floodmark).

1930 to April 1948: Discharge, 3,200 second-feet May 12, 1947 (gage height, 17.22 feet).

Remarks.- Flood runoff not affected by artificial storage.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,690	2,960	715	11	1,990	1,550	487	21	2,360	983	410
2	1,760	2,690	675	12	2,060	1,480	477	22	2,750	942	410
3	1,810	2,460	637	13	2,080	1,410	466	23	3,330	914	408
4	1,830	2,300	609	14	2,080	1,340	449	24	3,770	893	397
5	1,820	2,170	584	15	2,050	1,290	439	25	4,150	888	380
6	1,790	2,080	558	16	2,020	1,220	431	26	4,320	873	364
7	1,750	1,970	539	17	2,000	1,160	418	27	4,200	847	353
8	1,750	1,860	527	18	1,990	1,120	403	28	3,900	818	366
9	1,790	1,740	515	19	2,010	1,080	393	29	3,640	786	431
10	1,870	1,630	500	20	2,120	1,030	400	30	3,430	750	471
								31	3,220		473
Monthly mean discharge, in second-feet .....									2,494	1,441	474
Runoff, in inches .....									5.43	3.04	1.03

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	12.68	2,000	12.62	1,990	12.62	1,990	12.94	2,070	13.70	2,260	15.03	2,590
8	12.66	2,000	12.61	1,990	12.65	1,990	13.03	2,090	13.89	2,310	15.34	2,670
N	12.66	2,000	12.61	1,990	12.69	2,010	13.15	2,120	14.07	2,350	15.63	2,740
4	12.65	2,000	12.60	1,980	12.74	2,020	13.27	2,150	14.28	2,400	15.92	2,820
8	12.64	2,000	12.60	1,980	12.79	2,030	13.37	2,180	14.51	2,460	16.27	2,920
12	12.62	1,990	12.61	1,990	12.86	2,050	13.53	2,220	14.76	2,520	16.67	3,040
	May 23		May 24		May 25		May 26		May 27		May 28	
4	17.05	3,160	18.64	3,630	19.99	4,040	20.83	4,310	20.78	4,280	20.01	4,000
8	17.39	3,260	18.88	3,700	20.20	4,100	20.87	4,320	20.70	4,250	19.86	3,950
N	17.67	3,340	19.12	3,780	20.42	4,170	20.88	4,320	20.60	4,220	19.71	3,900
4	17.93	3,420	19.34	3,840	20.56	4,220	20.98	4,330	20.47	4,170	19.57	3,850
8	18.17	3,490	19.55	3,900	20.68	4,260	20.88	4,320	20.32	4,120	19.44	3,810
12	18.40	3,560	19.75	3,960	20.77	4,290	20.83	4,310	20.17	4,060	19.30	3,760
	May 29		May 30		May 31		June 1		June 2		June 3	
4	19.17	3,720	18.48	3,500	17.77	3,290	16.99	3,060	16.06	2,780	15.12	2,520
8	19.03	3,670	18.36	3,470	17.67	3,260	16.82	3,010	15.90	2,730	14.98	2,480
N	18.90	3,630	18.24	3,430	17.53	3,220	16.68	2,960	15.76	2,690	14.88	2,460
4	18.82	3,610	18.13	3,400	17.40	3,180	16.53	2,920	15.61	2,640	14.80	2,440
8	18.72	3,580	18.01	3,360	17.26	3,140	16.38	2,870	15.45	2,600	14.68	2,410
12	18.60	3,540	17.90	3,330	17.12	3,100	16.21	2,820	15.27	2,560	14.56	2,380
	June 4		June 5		June 6		June 7		June 8		June 9	
4	14.44	2,350	13.88	2,210	13.48	2,110	13.07	2,010	12.57	1,890	12.08	1,780
8	14.33	2,320	13.78	2,180	13.41	2,090	12.99	1,990	12.50	1,880	11.98	1,760
N	14.23	2,300	13.73	2,170	13.35	2,080	12.90	1,970	12.44	1,860	11.89	1,740
4	14.13	2,270	13.67	2,160	13.29	2,060	12.82	1,950	12.37	1,850	11.80	1,720
8	14.04	2,250	13.60	2,140	13.22	2,040	12.74	1,930	12.28	1,820	11.70	1,700
12	13.96	2,230	13.54	2,120	13.15	2,030	12.65	1,910	12.19	1,800	11.60	1,680
	June 10		June 11		June 12		June 13		June 14		June 15	
4	11.54	1,670	11.06	1,570	10.71	1,500	10.37	1,430	10.00	1,360	9.75	1,310
8	11.44	1,650	11.00	1,560	10.65	1,490	10.32	1,420	9.97	1,350	9.70	1,300
N	11.35	1,630	10.93	1,550	10.59	1,480	10.26	1,410	9.92	1,340	9.66	1,290
4	11.26	1,610	10.87	1,530	10.54	1,470	10.19	1,400	9.87	1,330	9.60	1,280
8	11.19	1,600	10.81	1,520	10.48	1,460	10.13	1,390	9.83	1,330	9.53	1,270
12	11.12	1,580	10.76	1,510	10.42	1,440	10.07	1,370	9.79	1,320	9.47	1,250
	June 16		June 17		June 18		June 19		June 20		June 21	
4	9.40	1,240	9.07	1,170	8.86	1,130	8.67	1,100	8.42	1,050	8.12	998
8	9.34	1,230	9.03	1,170	8.84	1,130	8.64	1,090	8.38	1,040	8.08	990
N	9.29	1,220	8.98	1,160	8.81	1,120	8.60	1,080	8.32	1,030	8.05	985
4	9.22	1,200	8.95	1,150	8.78	1,110	8.56	1,080	8.26	1,020	7.98	972
8	9.16	1,200	8.91	1,140	8.74	1,110	8.51	1,070	8.22	1,020	7.96	969
12	9.12	1,180	8.88	1,140	8.70	1,100	8.46	1,060	8.17	1,010	7.93	963

## Whitefish Creek near Kalispell, Mont.

Location.- Lat. 48°19', long. 114°16', in SW $\frac{1}{4}$  sec. 34, T. 30 N., R. 21 W., 8 miles north of Kalispell and 8 miles upstream from mouth. Datum of gage is 2,969.7 feet above mean sea level, datum of 1929 (Corps of Engineers bench mark).

Drainage area.- 173 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 1,290 second-feet 8 p.m. May 30 (gage height, 4.41 feet).

1928 to April 1948: Discharge, 1,260 second-feet June 3, 1932 (gage height, 4.26 feet).

Remarks.- Some regulation by Whitefish Lake.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	566	1,260	442	11	591	1,100	284	21	726	712	245
2	546	1,240	423	12	583	1,080	273	22	817	676	224
3	538	1,240	400	13	583	1,040	259	23	974	667	207
4	538	1,240	385	14	583	1,010	248	24	1,060	650	195
5	534	1,250	366	15	562	966	242	25	1,080	628	182
6	534	1,210	351	16	558	915	231	26	1,110	603	173
7	570	1,200	339	17	559	875	217	27	1,140	574	164
8	620	1,180	324	18	585	842	211	28	1,180	542	179
9	628	1,150	309	19	616	792	207	29	1,220	506	217
10	603	1,120	298	20	669	748	220	30	1,270	466	211
								31	1,280		179
Monthly mean discharge, in second-feet.									756	915	265
Runoff, in inches									5.04	5.90	1.76

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	2.80	558	2.86	583	2.92	607	3.04	659	3.18	720	3.35	796
8	2.80	558	2.88	591	2.96	624	3.09	681	3.21	733	3.44	836
N												
4	2.82	566	2.89	595	2.99	637	3.13	698	3.25	751	3.55	886
8												
12												
	May 23		May 24		May 25		May 26		May 27		May 28	
4	3.68	945	3.92	1,060	3.95	1,070	4.02	1,100	4.09	1,140	4.17	1,170
8	3.82	1,010	3.93	1,060	3.98	1,080	4.04	1,110	4.10	1,140	4.20	1,190
N												
4	3.90	1,050	3.93	1,060	4.00	1,090	4.07	1,130	4.14	1,160	4.22	1,200
8												
12												
	May 29		May 30		May 31		June 1		June 2		June 3	
4	4.26	1,220	4.36	1,270	4.39	1,280	4.34	1,260	4.32	1,250	4.30	1,240
8	4.29	1,230	4.40	1,280	4.37	1,270	4.33	1,250	4.30	1,240	4.29	1,230
N												
4	4.31	1,240	4.40	1,280	4.36	1,270	4.32	1,250	4.30	1,240	4.31	1,240
8												
12												
	June 4		June 5		June 6		June 7		June 8		June 9	
4	4.31	1,240	4.29	1,230	4.25	1,210	4.23	1,200	4.19	1,180	4.13	1,150
8	4.30	1,240	4.27	1,220	4.25	1,210	4.22	1,200	4.17	1,170	4.12	1,150
N												
4	4.30	1,240	4.26	1,220	4.24	1,210	4.21	1,190	4.16	1,170	4.08	1,130
8												
12												
	June 10		June 11		June 12		June 13		June 14		June 15	
4	4.06	1,120	4.01	1,100	3.97	1,080	3.91	1,050	3.83	1,010	3.74	972
8	4.06	1,120	4.00	1,090	3.95	1,070	3.87	1,030	3.80	1,000	3.71	959
N												
4	4.03	1,110	3.99	1,090	3.94	1,060	3.85	1,020	3.78	991	3.67	940
8												
12												
	June 16		June 17		June 18		June 19		June 20		June 21	
4	3.64	926	3.54	881	3.47	850	3.36	800	3.26	755	3.17	716
8	3.59	904	3.51	868	3.44	836	3.33	786	3.23	742	3.15	707
N												
4	3.56	890	3.50	863	3.39	814	3.29	769	3.20	729	3.13	698
8												
12												

Supplemental record.- May 30, 2 p.m., 4.40 ft., 1,280 sec.-ft., 8 p.m., 4.41 ft., 1,290 sec.-ft.

Location.- Lat.  $48^{\circ}10'$ , long.  $114^{\circ}26'$ , in NW $\frac{1}{4}$  sec. 29, T. 28 N., R. 22 W., 5 miles west of Kalispell (revised).

Gage-height record. - Graph drawn on basis of two or more wire-weight gage readings daily for period May 17 to June 21. Average of twice-daily readings used May 1-17, June 22 to July 31, except May 10-13 when no readings were obtained and discharge was estimated. Crest gage height determined from graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Shifting-control method used May 8-23. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 749 second-feet 12 p.m. May 27 (gage height, 7.58 feet).

1951 to April 1948: Discharge, 365 second-feet May 12, 1947 (gage height, 6.26 feet).

Remarks.- Storage in Ashley and Smith Lakes.

Monthly mean discharge, in second-feet				Monthly mean discharge, in second-feet				Monthly mean discharge, in second-feet			
Day	May	June	July	Day	May	June	July	Day	May	June	July
1	284	657	188	11	425	394	127	21	510	265	98
2	292	627	178	12	440	385	124	22	533	251	94
3	300	608	170	13	455	370	119	23	562	242	90
4	308	594	162	14	468	347	114	24	643	231	87
5	306	567	155	15	462	327	109	25	694	229	84
6	304	533	149	16	454	312	104	26	714	224	81
7	306	502	144	17	452	302	101	27	729	234	79
8	340	471	138	18	455	293	98	28	733	227	80
9	387	441	133	19	457	286	98	29	719	215	82
10	410	419	128	20	476	275	99	30	715	201	82
							81		680		81
Monthly mean discharge, in second-feet								484		368	
Runoff, in inches								2.74		2.02	
										0.65	

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4 N 4 8 12	6.84	454	6.84	454	6.86	456	6.88	462	7.09	508	7.22	531
	6.82	448	6.86	456	6.87	459	6.99	486	7.12	514	7.26	538
	6.84	454	6.86	456	6.87	459	7.04	498	7.16	521	7.29	541
	May 23		May 24		May 25		May 26		May 27		May 28	
4 N 4 8 12	7.36	544	7.30	632	7.44	689	7.50	714	7.52	723	7.55	736
	7.14	572	7.37	660	7.47	701	7.50	714	7.54	732	7.53	727
	7.22	602	7.40	672	7.49	710	7.51	718	7.58	749	7.52	723
	May 29		May 30		May 31		June 1		June 2		June 3	
4 N 4 8 12	7.52	723	7.52	723	7.42	680	7.38	664	7.30	632	7.24	609
	7.50	714	7.50	714	7.41	676	7.35	652	7.28	624	7.24	609
	7.51	718	7.47	701	7.39	668	7.32	640	7.25	613	7.22	602
	June 4		June 5		June 6		June 7		June 8		June 9	
4 N 4 8 12	7.22	602	7.14	572	7.04	538	6.95	508	6.85	477	6.74	445
	7.19	590	7.11	562	7.01	527	6.91	495	6.81	465	6.71	437
	7.16	580	7.08	551	6.98	518	6.88	486	6.78	456	6.68	429
	June 10		June 11		June 12		June 13		June 14		June 15	
4 N 4 8 12	6.66	423	6.55	394	6.52	387	6.47	375	6.37	351	6.30	335
	6.64	418	6.54	392	6.51	384	6.43	365	6.33	342	6.24	322
	6.59	404	6.53	390	6.49	380	6.40	358	6.31	357	6.20	314
	June 16		June 17		June 18		June 19		June 20		June 21	
4 N 4 8 12	6.20	314	6.15	304	6.10	294	6.07	288	6.02	279	5.96	267
	6.19	312	6.13	300	6.09	292	6.05	284	5.99	273	5.94	264
	6.17	308	6.11	296	6.08	290	6.03	281	5.97	269	5.92	260

## Swan River near Big Fork, Mont.

Location.- Lat. 48°01', long. 113°59', in NW $\frac{1}{4}$  sec. 14, T. 26 N., R. 19 W., at outlet of Swan Lake, 7 miles southeast of Big Fork.

Drainage area.- 647 square miles.

Gage-height record.- Water-stage recorder graph except for periods noon May 23 to 8 a.m. May 25 and 11 p.m. May 26 to 6 p.m. May 27, when gage heights were estimated or obtained from g.p.m. through observer's readings. Peak stage determined from floodmark.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 6,500 second-feet and extended to peak stage. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 8,400 second-feet 8 a.m. to 4 p.m. May 24 (gage height, 7.12 feet, from floodmark).

1922 to April 1948: Discharge, 8,280 second-feet June 18, 1933 (gage height, 7.00 feet).

Remarks.- No diversion above station.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2,870	6,510	2,610	11	3,780	6,490	1,650	21	5,000	3,320	1,260
2	2,920	6,300	2,540	12	3,530	6,250	1,560	22	6,340	3,240	1,240
3	2,870	6,410	2,460	13	3,260	5,750	1,480	23	7,760	3,260	1,200
4	2,740	6,780	2,340	14	3,170	5,240	1,430	24	8,350	3,280	1,190
5	2,720	7,100	2,240	15	3,160	4,820	1,380	25	7,660	3,220	1,130
6	2,620	6,970	2,080	16	3,060	4,480	1,320	26	7,070	3,120	1,090
7	2,610	6,580	1,970	17	2,920	4,230	1,290	27	6,980	3,000	1,050
8	2,790	6,340	1,900	18	2,980	4,110	1,230	28	7,160	2,870	1,090
9	3,290	6,280	1,800	19	3,400	3,910	1,200	29	7,440	2,730	1,170
10	3,780	6,400	1,760	20	4,010	3,650	1,230	30	7,390	2,660	1,170
								31	7,000		1,170
Monthly mean discharge, in second-feet.....									4,536	4,843	1,556
Runoff, in inches.....									8.08	8.36	2.77

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	4.50	2,980	4.47	2,930	4.65	3,220	4.95	3,760	5.37	4,590	6.06	6,010
8	4.48	2,950	4.47	2,930	4.70	3,310	5.01	3,680	5.46	4,770	6.09	6,070
N	4.45	2,900	4.48	2,950	4.74	3,380	5.07	3,990	5.57	4,990	6.18	6,270
4	4.44	2,880	4.50	2,980	4.79	3,470	5.12	4,090	5.68	5,170	6.30	6,530
8	4.45	2,900	4.55	3,060	4.86	3,600	5.20	4,250	5.77	5,400	6.41	6,770
12	4.46	2,920	4.59	3,110	4.91	3,690	5.30	4,450	5.92	5,710	6.54	7,060
	May 23		May 24		May 25		May 26		May 27		May 28	
4	6.68	7,380	7.10	8,350	6.94	7,980	6.63	7,270	6.51	6,990	6.53	7,040
8	6.79	7,640	7.12	8,400	6.86	7,800	6.62	7,250	6.51	6,990	6.53	7,040
N	6.87	7,820	7.12	8,400	6.78	7,610	6.49	6,950	6.51	6,990	6.56	7,110
4	6.94	7,980	7.12	8,400	6.71	7,450	6.47	6,900	6.50	6,970	6.62	7,250
8	7.00	8,120	7.10	8,350	6.67	7,360	6.48	6,930	6.49	6,950	6.67	7,360
12	7.05	8,240	7.04	8,210	6.64	7,290	6.51	6,990	6.49	6,950	6.68	7,380
	May 29		May 30		May 31		June 1		June 2		June 3	
4	6.68	7,380	6.73	7,500	6.59	7,180	6.36	6,660	6.20	6,310	6.22	6,350
8	6.69	7,410	6.72	7,480	6.57	7,130	6.33	6,600	6.20	6,310	6.20	6,310
N	6.70	7,430	6.70	7,430	6.54	7,060	6.30	6,530	6.18	6,270	6.23	6,380
4	6.72	7,480	6.67	7,360	6.47	6,900	6.24	6,400	6.17	6,240	6.27	6,460
8	6.74	7,520	6.62	7,250	6.42	6,790	6.22	6,350	6.20	6,310	6.28	6,490
12	6.74	7,520	6.58	7,150	6.39	6,730	6.20	6,310	6.22	6,350	6.31	6,550
	June 4		June 5		June 6		June 7		June 8		June 9	
4	6.34	6,620	6.54	7,060	6.57	7,130	6.42	6,790	6.27	6,460	6.18	6,270
8	6.38	6,710	6.56	7,110	6.54	7,060	6.36	6,660	6.25	6,420	6.19	6,290
N	6.41	6,770	6.56	7,110	6.49	6,950	6.30	6,530	6.18	6,270	6.19	6,290
4	6.46	6,880	6.56	7,110	6.46	6,880	6.27	6,460	6.18	6,270	6.17	6,240
8	6.49	6,950	6.57	7,130	6.44	6,840	6.25	6,420	6.17	6,240	6.19	6,290
12	6.51	6,990	6.57	7,130	6.43	6,820	6.26	6,440	6.18	6,270	6.23	6,380
	June 10		June 11		June 12		June 13		June 14		June 15	
4	6.22	6,350	6.26	6,440	6.24	6,400	6.03	5,940	5.79	5,440	5.55	4,950
8	6.25	6,380	6.33	6,600	6.22	6,350	5.99	5,860	5.74	5,330	5.52	4,890
N	6.25	6,420	6.27	6,460	6.18	6,270	5.93	5,730	5.68	5,210	5.49	4,830
4	6.25	6,420	6.28	6,490	6.13	6,160	5.89	5,650	5.64	5,130	5.44	4,730
8	6.26	6,440	6.29	6,510	6.10	6,090	5.85	5,560	5.61	5,070	5.41	4,670
12	6.26	6,440	6.26	6,440	6.07	6,030	5.82	5,500	5.59	5,030	5.40	4,650
	June 16		June 17		June 18		June 19		June 20		June 21	
4	5.37	4,590	5.24	4,330	5.15	4,150	5.07	3,990	4.95	3,760	4.75	3,400
8	5.35	4,510	5.21	4,270	5.15	4,150	5.05	3,960	4.94	3,750	4.72	3,350
N	5.30	4,450	5.18	4,210	5.13	4,110	5.02	3,900	4.91	3,690	4.69	3,290
4	5.29	4,430	5.16	4,170	5.12	4,090	5.01	3,880	4.85	3,580	4.68	3,280
8	5.28	4,410	5.15	4,150	5.11	4,070	4.98	3,820	4.81	3,510	4.67	3,260
12	5.25	4,370	5.14	4,130	5.09	4,030	4.97	3,800	4.76	3,420	4.67	3,260

## Priest Lake at outlet, near Coolin, Idaho

Location.- Lat. 48°29'30", long. 116°53'00", in SE $\frac{1}{4}$  sec. 5, T. 59 N., R. 4 W., half a mile east of outlet and 1 $\frac{1}{2}$  miles northwest of Coolin. Datum of gage is 2,435.06 feet (Coast and Geodetic Survey datum) or 2,437.99 feet (Geological Survey datum) above mean sea level.

Drainage area.- 572 square miles.

Gage-height record.- Water-stage recorder graph except for periods May 1-28, July 12-24.

Staff gage was read May 5, 10, 17, 25, July 13, 18, 20.

Maxima.- May-June 1948: Gage height, 6.46 feet 4 p.m. May 29 to 5 a.m. May 30.

1928 to April 1948: Gage height observed, 5.94 feet May 23, 1932.

Mean gage height, in feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1		6.19	2.97	11		5.28	2.26	21		3.82	
2		6.10	2.86	12		5.18		22		3.71	
3		6.02	2.76	13		5.02	2.08	23		3.63	
4		5.96	2.66	14		4.84		24		3.62	
5	3.50	5.87	2.59	15		4.65		25	5.78	3.56	1.67
6		5.77	2.54	16		4.50		26		3.49	1.63
7		5.65	2.50	17	4.00	4.39		27		3.40	1.58
8		5.55	2.45	18		4.27	1.80	28		3.30	1.62
9		5.45	2.39	19		4.11		29	6.45	3.20	1.62
10	3.73	5.38	2.33	20		3.94	1.82	30	6.43	3.08	1.60
								31	6.32		1.57



Priest River at outlet of Priest Lake, near Coolin, Idaho

Location.- Lat. 48°29', long. 116°54', in SW<sup>1</sup> sec. 5, T. 59 N., R. 4 W., at southwest end of Priest Lake, 2 miles northwest of Coolin. Datum of gage is 2,435.06 feet (Coast and Geodetic Survey datum) or 2,437.99 feet (Geological Survey datum) above mean sea level.

Drainage area.- 572 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Shifting-control method used May 1-12, July 21-31.

Maxima.- May-June 1948: Discharge, 8,560 second-feet 4 p.m. to 10 p.m. May 29 (gage height, 5.53 feet).

1911 to April 1948: Discharge, 7,290 second-feet May 30, 1917 (gage height, 6.83 feet).

Remarks.- No diversion above station.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2,980	8,040	2,840	11	3,400	6,460	1,930	21	5,620	4,060	1,210
2	2,960	7,840	2,700	12	3,830	6,300	1,850	22	6,180	3,930	1,280
3	2,950	7,700	2,540	13	4,110	6,010	1,780	23	6,760	3,790	1,230
4	3,000	7,580	2,400	14	4,220	5,700	1,710	24	7,120	3,790	1,180
5	2,950	7,460	2,330	15	4,280	5,380	1,640	25	7,290	3,720	1,130
6	2,980	7,320	2,290	16	4,330	5,140	1,590	26	7,510	3,650	1,110
7	3,060	7,090	2,240	17	4,410	4,970	1,530	27	7,840	3,480	1,080
8	3,150	6,900	2,190	18	4,560	4,750	1,460	28	8,250	3,340	1,110
9	3,230	6,740	2,110	19	4,730	4,490	1,000	29	8,500	3,180	1,100
10	3,320	6,630	2,030	20	5,080	4,230	1,000	30	8,480	3,010	1,080
								31	8,270		1,070
Monthly mean discharge, in second-feet .....									5,011	5,422	1,669
Runoff, in inches .....									10.10	10.58	3.36

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	3.07	4,360	3.17	4,520	3.25	4,650	3.42	4,920	3.72	5,420	4.04	5,970
8	3.09	4,390	3.19	4,550	3.28	4,700	3.47	5,000	3.79	5,540	4.06	6,040
N	3.10	4,410	3.20	4,570	3.30	4,730	3.51	5,070	3.84	5,630	4.19	6,220
4	3.11	4,430	3.21	4,590	3.32	4,760	3.56	5,150	3.89	5,710	4.23	6,290
8	3.13	4,460	3.22	4,600	3.35	4,810	3.61	5,240	3.95	5,820	4.28	6,380
12	3.15	4,490	3.23	4,620	3.38	4,860	3.66	5,320	4.00	5,900	4.36	6,510
	May 23		May 24		May 25		May 26		May 27		May 28	
4	4.41	6,600	4.67	7,040	4.79	7,240	4.90	7,430	5.04	7,680	5.29	8,130
8	4.46	6,680	4.70	7,090	4.80	7,260	4.93	7,480	5.09	7,770	5.33	8,200
N	4.51	6,770	4.71	7,110	4.81	7,280	4.95	7,520	5.13	7,840	5.37	8,280
4	4.55	6,840	4.74	7,160	4.83	7,310	4.96	7,540	5.17	7,920	5.39	8,310
8	4.59	6,900	4.76	7,190	4.85	7,340	4.98	7,570	5.21	7,990	5.42	8,370
12	4.63	6,970	4.78	7,230	4.87	7,380	5.03	7,660	5.25	8,060	5.44	8,400
	May 29		May 30		May 31		June 1		June 2		June 3	
4	5.46	8,440	5.51	8,530	5.41	8,350	5.27	8,100	5.17	7,920	5.07	7,740
8	5.48	8,470	5.50	8,510	5.38	8,290	5.26	8,080	5.15	7,880	5.06	7,720
N	5.50	8,510	5.49	8,490	5.36	8,260	5.24	8,040	5.13	7,840	5.05	7,700
4	5.53	8,560	5.48	8,470	5.35	8,240	5.22	8,010	5.11	7,810	5.04	7,680
8	5.53	8,560	5.45	8,420	5.32	8,190	5.21	7,990	5.09	7,770	5.03	7,660
12	5.52	8,550	5.43	8,380	5.30	8,150	5.19	7,950	5.08	7,750	5.02	7,650
	June 4		June 5		June 6		June 7		June 8		June 9	
4	5.01	7,630	4.94	7,500	4.87	7,380	4.73	7,140	4.63	6,970	4.52	6,780
8	5.00	7,610	4.93	7,480	4.85	7,340	4.71	7,110	4.61	6,940	4.50	6,750
N	4.98	7,570	4.93	7,480	4.84	7,330	4.69	7,070	4.59	6,900	4.48	6,720
4	4.97	7,560	4.91	7,450	4.82	7,290	4.68	7,060	4.56	6,850	4.47	6,700
8	4.96	7,540	4.89	7,410	4.80	7,260	4.66	7,020	4.54	6,820	4.48	6,720
12	4.95	7,520	4.88	7,400	4.79	7,240	4.64	6,990	4.53	6,800	4.47	6,700
	June 10		June 11		June 12		June 13		June 14		June 15	
4	4.46	6,680	4.36	6,510	4.28	6,380	4.13	6,120	3.94	5,800	3.76	5,490
8	4.44	6,650	4.34	6,480	4.26	6,340	4.10	6,070	3.91	5,750	3.73	5,440
N	4.44	6,650	4.32	6,440	4.24	6,310	4.06	6,000	3.88	5,700	3.70	5,390
4	4.42	6,610	4.31	6,430	4.22	6,270	4.03	5,950	3.85	5,640	3.66	5,320
8	4.39	6,560	4.31	6,430	4.19	6,220	4.00	5,900	3.82	5,590	3.63	5,270
12	4.36	6,510	4.29	6,390	4.16	6,170	3.97	5,850	3.79	5,540	3.61	5,240
	June 16		June 17		June 18		June 19		June 20		June 21	
4	3.60	5,220	3.48	5,020	3.36	4,830	3.20	4,570	3.04	4,310	2.89	4,070
8	3.56	5,150	3.47	5,000	3.34	4,790	3.18	4,540	3.01	4,270	2.88	4,060
N	3.54	5,120	3.46	4,990	3.32	4,760	3.15	4,490	2.98	4,220	2.86	4,030
4	3.52	5,080	3.44	4,950	3.29	4,710	3.12	4,440	2.96	4,190	2.89	4,070
8	3.53	5,100	3.41	4,910	3.25	4,650	3.10	4,410	2.94	4,150	2.88	4,060
12	3.51	5,070	3.38	4,860	3.23	4,620	3.07	4,360	2.91	4,110	2.86	4,030

## Priest River near Priest River, Idaho

Location.- Lat. 48°13', long. 116°55', in NE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 11, T. 56 N., R. 5 W., 500 feet downstream from Saddler Creek, a quarter of a mile downstream from Lower West Branch, 2 $\frac{1}{2}$  miles north of Priest River, and 3 $\frac{1}{2}$  miles upstream from mouth.

Drainage area.- 902 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge, 10,500 second-feet 10 a.m. May 29 to 10 a.m. May 30; gage height, 8.97 feet 10 p.m. May 29.

1903-5, 1910-11, 1923, 1929 to April 1948: Discharge, 8,890 second-feet May 23, 1932 (gage height, 8.03 feet).

Remarks.- No diversion above station. Some regulation on tributary.

## Mean discharge, in second-feet, 1948

mean discharge, in second-feet, 1948											
Day	May	June	July	Day	May	June	July	Day	May	June	July
1	4,570	9,680	3,600	11	5,800	7,780	2,440	21	7,550	5,190	1,480
2	4,500	9,440	3,430	12	5,770	7,680	2,330	22	8,210	4,940	1,580
3	4,540	9,300	3,500	13	6,720	7,270	2,240	23	9,060	4,710	1,590
4	5,020	9,360	3,140	14	6,900	6,840	2,170	24	9,400	4,660	1,540
5	4,870	9,160	3,160	15	6,660	6,520	2,110	25	9,480	4,610	1,510
6	4,720	8,810	3,090	16	6,430	6,510	2,060	26	9,630	4,310	1,460
7	5,080	8,530	2,830	17	6,410	6,640	1,980	27	9,860	4,160	1,460
8	5,470	8,250	2,800	18	6,510	6,130	1,910	28	10,200	3,960	1,550
9	5,530	8,060	2,650	19	6,590	5,700	1,910	29	10,400	3,800	1,550
10	5,500	7,970	2,540	20	6,940	5,390	1,170	30	10,400	3,700	1,490
								31	10,100		1,440
Monthly mean discharge, in second-feet.....									7,059	6,635	2,178
Runoff, in inches.....									9.02	8.21	2.78

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	6.49	6,380	6.57	6,510	6.60	6,560	6.76	6,820	7.15	7,460	7.47	8,000
8											7.60	8,220
N	6.51	6,420	6.57	6,510	6.62	6,590	6.89	7,020	7.27	7,660	7.72	8,420
4											7.75	8,480
8											7.83	8,610
12	6.56	6,500	6.59	6,540	6.70	6,720	7.03	7,250	7.37	7,830		
	May 23		May 24		May 25		May 26		May 27		May 28	
4	8.06	9,000			8.34	9,480	8.44	9,650	8.58	9,890	8.76	10,200
8	8.18	9,210	8.31	9,430							8.79	10,200
N												
4												
8												
12	8.25	9,320	8.32	9,440	8.37	9,530	8.46	9,680	8.63	9,970	8.86	10,400
	May 29		May 30		May 31		June 1		June 2		June 3	
4	8.89	10,400	8.93	10,500	8.76	10,200	8.49	9,730	8.35	9,500	8.24	9,310
8												
N	8.94	10,500	8.88	10,400	8.67	10,000	8.42	9,610	8.29	9,390	8.22	9,270
4												
8												
12	8.94	10,500	8.81	10,300	8.56	9,850	8.39	9,560	8.25	9,320	8.23	9,290
	June 4		June 5		June 6		June 7		June 8		June 9	
4	8.30	9,410	8.18	9,210	7.98	8,870	7.81	8,580	7.67	8,340	7.46	7,980
8									7.64	8,290	7.44	7,950
N	8.28	9,380	8.14	9,140	7.91	8,750	7.75	8,480	7.57	8,170	7.57	8,170
4											7.54	8,120
8											7.57	8,170
12	8.24	9,310	8.04	8,970	7.86	8,660	7.71	8,410	7.50	8,050		
	June 10		June 11		June 12		June 13		June 14		June 15	
4					7.35	7,800						
8	7.49	8,030	7.35	7,800								
N			7.32	7,740	7.28	7,680	7.03	7,250	6.77	6,830	6.52	6,430
4	7.40	7,880	7.32	7,740			6.99	7,180			6.54	6,460
8											6.64	6,620
12	7.36	7,810	7.35	7,800	7.18	7,510	6.91	7,060	6.64	6,620	6.60	6,560
	June 16		June 17		June 18		June 19		June 20		June 21	
4	6.55	6,480	6.72	6,750	6.45	6,320			5.90	5,470		
8												
N	6.50	6,400	6.68	6,690	6.32	6,110	6.04	5,680	5.85	5,400	5.70	5,170
4	6.53	6,450	6.64	6,620					5.82	5,350	5.72	5,200
8	6.66	6,660					5.98	5,590			5.70	5,170
12	6.71	6,740	6.50	6,400	6.18	5,890	5.94	5,530	5.76	5,260	5.65	5,100

Supplemental record.- May 29, 10 p.m., 8.97 ft., 10,500 sec.-ft.; June 9, 3 p.m., 7.46 ft., 7,980 sec.-ft.; June 15, 2:30 p.m., 6.51 ft., 6,420 sec.-ft.

## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

## Kettle River Basin

Kettle River near Ferry, Wash.  
(International gaging station)

**Location.**- Lat. 48°58'40", long. 118°46'10", in lot 7, sec. 10, T. 40 N., R. 32 E., 1½ miles south of international boundary and Ferry and 3 miles upstream from Toroda Creek. Datum of gage is 1,840.00 feet above mean sea level (subject to correction to datum of 1929).

**Drainage area.**- 2,220 square miles.

**Gage-height record.**- Water-stage recorder graph.

**Discharge record.**- Stage-discharge relation defined by current-meter measurements below 16,700 second-feet and extended to peak stage on basis of conveyance-slope studies, area-velocity studies, and logarithmic plotting. Gage heights used to hundredths May 17 to June 21; half-tenths between 11.3 and 13.5 feet; hundredths below and tenths above these limits May 1-16 and June 22 to July 31.

**Maxima.**- May-June 1948: Discharge, 21,200 second-feet 4 a.m. May 29 (gage height, 21.15 feet).

1928 to April 1948: Discharge, 18,200 second-feet May 27, 1942 (gage height, 20.54 feet).

**Remarks.**- Several small diversions above station for irrigation which are probably a very small percentage of flood discharge. This station is one of the international gaging stations maintained by the United States under agreement with Canada. Records provisional, subject to revision.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	5,490	12,300	2,490	11	6,420	13,900	1,610	21	11,300	6,090	1,320
2	4,790	11,700	2,260	12	7,000	11,200	1,710	22	13,700	6,610	1,170
3	4,460	11,600	2,090	13	6,010	9,520	1,820	23	14,200	5,670	1,060
4	4,790	11,500	1,920	14	8,430	8,160	1,610	24	15,800	4,960	1,020
5	4,620	11,300	1,820	15	7,800	7,450	1,360	25	16,500	4,460	1,040
6	4,790	11,300	1,870	16	7,400	7,590	1,360	26	15,900	4,000	984
7	6,230	11,500	1,920	17	6,170	8,440	1,320	27	17,100	3,640	928
8	6,420	11,500	1,920	18	9,450	7,980	1,220	28	19,300	3,300	1,060
9	6,420	11,100	1,980	19	9,450	6,840	1,220	29	20,300	3,040	1,510
10	6,420	11,100	1,760	20	9,420	6,110	1,320	30	17,900	2,730	1,320
								31	13,900		1,150
Monthly mean discharge, in second-feet									10,060	8,219	1,524
Runoff, in inches									5.22	4.13	0.79

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	15.67	7,540	16.45	9,180	16.65	9,620	16.40	9,070	17.04	10,500	18.14	13,100
8	15.80	7,800	16.52	9,350	16.63	9,580	16.41	9,090	17.20	10,900	18.29	13,500
N	15.99	8,200	16.60	9,510	16.59	9,480	16.50	9,290	17.38	11,300	18.39	13,700
4	16.14	8,510	16.67	9,660	16.55	9,400	16.66	9,640	17.59	11,800	18.52	14,100
8	16.26	8,770	16.68	9,690	16.48	9,250	16.75	9,840	17.76	12,200	18.61	14,300
12	16.37	9,000	16.67	9,660	16.40	9,070	16.67	10,100	17.91	12,600	18.67	14,500
	May 23		May 24		May 25		May 26		May 27		May 28	
4	18.66	14,400	18.87	15,000	19.68	17,100	19.22	15,900	19.63	17,000	20.33	18,900
8	18.58	14,200	19.02	15,400	19.60	16,900	19.14	15,700	19.68	17,100	20.40	19,100
N	18.49	14,000	19.19	15,800	19.49	16,600	19.10	15,600	19.63	17,000	20.40	19,100
4	18.47	13,900	19.38	16,300	19.33	16,200	19.14	15,700	19.61	16,900	20.50	19,400
8	18.54	14,100	19.36	16,800	19.23	15,900	19.30	16,100	19.80	17,400	20.71	19,900
12	18.69	14,500	19.65	17,000	19.20	15,800	19.47	16,500	20.12	18,300	21.00	20,800
	May 29		May 30		May 31		June 1		June 2		June 3	
4	21.15	21,200	20.64	19,700	18.80	14,800	17.92	12,600	17.53	11,600	17.41	11,400
8	21.02	20,800	20.40	19,100	18.55	14,100	17.71	12,100	17.45	11,400	17.34	11,200
N	20.79	20,200	20.05	18,100	18.38	13,700	17.65	11,900	17.53	11,600	17.45	11,400
4	20.60	19,600	19.55	16,800	18.29	13,500	17.81	12,500	17.62	11,900	17.62	11,900
8	20.60	19,600	19.28	16,000	18.23	13,300	17.78	12,200	17.65	11,900	17.73	12,100
12	20.68	19,900	19.03	15,400	18.12	13,100	17.66	12,000	17.58	11,800	17.70	12,000
	June 4		June 5		June 6		June 7		June 8		June 9	
4	17.57	11,700	17.29	11,100	17.19	10,800	17.30	11,100	17.50	11,600	17.24	11,000
8	17.39	11,500	17.23	10,900	17.13	10,700	17.19	10,800	17.29	11,100	17.08	10,600
N	17.41	11,400	17.33	11,200	17.31	11,100	17.38	11,300	17.36	11,200	17.22	10,900
4	17.49	11,500	17.46	11,500	17.52	11,600	17.62	11,900	17.54	11,700	17.44	11,400
8	17.51	11,600	17.48	11,500	17.60	11,800	17.73	12,100	17.60	11,800	17.43	11,400
12	17.41	11,400	17.46	11,500	17.52	11,600	17.69	12,000	17.47	11,500	17.27	11,000
	June 10		June 11		June 12		June 13		June 14		June 15	
4	17.03	10,500	18.14	13,100	17.61	11,800	16.76	9,860	16.05	8,320	15.62	7,440
8	16.91	10,200	18.45	13,900	17.38	11,300	16.65	9,620	15.96	8,140	15.58	7,360
N	17.00	10,800	18.69	14,500	17.27	11,000	16.65	9,620	15.99	8,200	15.65	7,500
4	17.49	11,500	18.76	14,700	17.20	10,900	16.59	9,490	15.99	8,200	15.69	7,560
8	17.68	12,000	18.69	14,500	17.14	10,700	16.39	9,050	15.87	7,950	15.60	7,400
12	17.83	12,400	18.10	13,000	16.98	10,400	16.19	8,620	15.73	7,660	15.51	7,220
	June 16		June 17		June 18		June 19		June 20		June 21	
4	15.42	7,040	16.10	8,430	15.89	7,990	15.49	7,180	14.95	6,140	14.80	5,850
8	15.44	7,080	16.13	8,490	15.82	7,840	15.35	6,900	14.89	6,020	14.80	5,850
N	15.64	7,480	16.18	8,600	15.89	7,990	15.29	6,780	14.95	6,140	14.87	5,980
4	15.67	7,950	16.15	8,540	15.98	8,180	15.24	6,690	15.00	6,230	15.00	6,230
8	16.01	8,240	16.05	8,320	15.90	8,010	15.15	6,520	14.90	6,040	15.07	6,360
12	16.05	8,320	15.98	8,180	15.68	7,560	15.05	6,320	14.83	5,910	15.13	6,480

Kettle River near Laurier, Wash.  
(International gaging station)

Location.- Lat. 48°50'50", long. 118°13'00", in SW $\frac{1}{4}$  sec. 11, T. 40 N., R. 36 E., 500 feet downstream from Deep Creek,  $\frac{1}{2}$  miles southeast of Laurier, and 12 miles upstream from Boulder Creek.

Drainage area.- 3,800 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below

28,000 second-feet and extended to peak stage on basis of slope-area measurement.

Gage heights used to hundredths May 17 to June 21; half-tenths below and tenths above 6.8 feet May 1-16, June 21 to July 31.

Maxima.- May-June 1948: Discharge, 35,000 second-feet 11 p.m. May 29 (gage height, 17.25 feet), by slope-area method.  
1929 to April 1948: Discharge, 27,400 second-feet May 28, 1942 (gage height, 15.73 feet).

Maximum stage known, about 22 feet sometime in May or June 1894, from information by local residents.

Remarks.- North Fork regulated by reservoir at Grand Forks, British Columbia. Numerous small diversions for irrigation and domestic supply are probably a small percentage of flood discharge.

This is an international gaging station maintained by the United States under agreement with Canada. Records provisional, subject to revision.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	11,300	22,400	4,810	11	12,600	22,200	3,050	21	19,200	10,700	2,300
2	10,100	21,200	4,460	12	13,100	20,800	2,910	22	24,100	11,100	2,140
3	9,170	21,000	4,040	13	14,100	17,300	3,050	23	25,300	10,300	1,990
4	9,630	21,000	3,720	14	15,500	14,900	2,910	24	25,600	8,710	1,890
5	9,630	20,500	3,490	15	14,700	13,500	2,650	25	27,800	8,260	1,890
6	9,400	20,300	3,490	16	13,600	13,100	2,530	26	27,100	7,380	1,840
7	11,100	20,400	3,490	17	14,100	14,300	2,410	27	28,400	6,960	1,740
8	12,600	20,600	3,490	18	16,400	13,800	2,300	28	31,400	6,340	1,790
9	12,600	19,600	3,490	19	16,700	12,600	2,240	29	34,200	5,740	2,040
10	12,600	19,200	3,260	20	16,500	11,300	2,300	30	32,800	5,360	2,140
								31	26,600		1,940
Monthly mean discharge, in second-feet									18,020	14,700	2,767
Runoff, in inches									5.47	4.31	0.84

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	10.97	13,500	11.84	15,900	12.17	16,800	12.01	16,400	12.52	17,900	13.78	22,000
8	11.00	13,600	11.95	16,200	12.16	16,800	11.97	16,200	12.70	18,400	13.92	22,400
N	11.12	13,900	12.05	16,500	12.15	16,800	12.00	16,300	12.91	19,100	14.03	22,800
4	11.28	14,300	12.10	16,600	12.14	16,700	12.06	16,500	13.16	19,900	14.35	23,900
8	11.48	14,900	12.15	16,800	12.10	16,600	12.18	16,900	13.40	20,700	15.46	28,000
12	11.65	15,400	12.17	16,800	12.07	16,500	12.35	17,400	13.62	21,400	15.69	28,800
	May 23		May 24		May 25		May 26		May 27		May 28	
4	15.07	26,500	14.50	24,500	15.37	27,600	15.32	27,400	15.38	27,700	16.16	30,600
8	14.67	25,100	14.61	24,900	15.42	27,800	15.14	26,800	15.35	27,600	16.16	30,600
N	14.55	24,600	14.77	25,400	15.45	27,900	15.09	26,600	15.44	27,900	16.24	30,900
4	14.52	24,500	14.98	26,200	15.46	28,000	15.15	26,800	15.63	28,600	16.42	31,600
8	14.49	24,400	15.17	26,900	15.51	28,100	15.29	27,300	15.87	29,500	16.69	32,700
12	14.47	24,400	15.30	27,400	15.48	28,000	15.38	27,700	16.07	30,300	16.94	33,700
	May 29		May 30		May 31		June 1		June 2		June 3	
4	17.03	34,100	17.13	34,500	15.69	28,800	14.10	23,100	13.55	21,200	13.46	20,900
8	17.01	34,000	16.88	33,500	15.29	27,500	13.99	22,700	13.52	21,100	13.45	20,800
N	16.99	33,900	16.65	32,600	15.00	26,500	13.91	22,400	13.54	21,100	13.49	21,000
4	17.03	34,100	16.48	31,900	14.80	25,500	13.82	22,100	13.55	21,200	13.54	21,100
8	17.18	34,700	16.35	31,400	14.57	24,700	13.72	21,800	13.55	21,200	13.56	21,200
12	17.24	34,900	16.10	30,400	14.32	23,800	13.62	21,400	13.54	21,100	13.56	21,200
	June 4		June 5		June 6		June 7		June 8		June 9	
4	13.54	21,100	13.35	20,500	13.28	20,300	13.25	20,200	13.36	20,500	13.15	19,900
8	13.52	21,100	13.35	20,500	13.25	20,200	13.25	20,200	13.36	20,500	13.12	19,800
N	13.54	21,100	13.35	20,500	13.25	20,200	13.30	20,400	13.40	20,700	13.12	19,800
4	13.49	21,000	13.35	20,500	13.30	20,400	13.35	20,500	13.40	20,700	13.05	19,500
8	13.42	20,700	13.35	20,500	13.33	20,400	13.37	20,600	13.35	20,500	12.95	19,200
12	13.36	20,500	13.34	20,500	13.32	20,400	13.40	20,700	13.25	20,200	12.94	19,200
	June 10		June 11		June 12		June 13		June 14		June 15	
4	12.93	19,100	13.50	21,000	13.88	22,500	12.65	18,300	11.75	15,600	11.10	13,900
8	12.93	19,100	13.80	22,000	13.74	21,800	12.48	17,700	11.56	15,100	11.04	13,700
N	12.88	19,000	14.00	22,700	13.45	20,800	12.33	17,300	11.44	14,800	10.96	13,500
4	12.84	18,900	14.15	23,200	13.16	19,900	12.16	16,800	11.33	14,500	10.88	13,300
8	12.94	19,200	14.12	23,100	12.96	19,200	12.00	16,300	11.25	14,300	10.84	13,200
12	13.21	20,100	14.02	22,800	12.80	18,700	11.87	16,000	11.19	14,100	10.80	13,100
	June 16		June 17		June 18		June 19		June 20		June 21	
4	10.75	12,900	11.22	14,200	11.20	14,100	10.87	13,300	10.19	11,500	9.92	10,900
8	10.74	12,900	11.26	14,300	11.14	14,000	10.74	12,900	10.15	11,400	9.83	10,700
N	10.78	13,000	11.30	14,400	11.10	13,900	10.60	12,600	10.07	11,200	9.80	10,600
4	10.83	13,100	11.32	14,500	11.00	13,600	10.45	12,200	10.00	11,100	9.78	10,500
8	10.92	13,400	11.33	14,500	10.93	13,400	10.34	11,900	9.99	11,000	9.85	10,700
12	11.09	13,600	11.28	14,300	10.91	13,400	10.26	11,700	9.97	11,000	9.94	10,900

Supplemental record.- May 22, 3 p.m., 14.15 ft., 23,200 sec.-ft., 10 p.m., 15.77 ft., 29,100 sec.-ft.; May 29, 11 p.m., 17.25 ft., 35,000 sec.-ft.



## Mill Creek near Colville, Wash.

Location.- Lat. 46°34'55", long. 117°51'00", in lot 3, NW¼ sec. 35, T. 36 N., R. 39 E., 3 miles northeast of Colville and 5 miles downstream from North Fork. Datum of gage is 1,964.3 feet above mean sea level (Stevens County bench mark, subject to correction to datum of 1929).

Drainage area.- 82 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 400 second-feet and extended to peak stage. Gage heights used to hundredths May 17 to June 21; half-tenths above and hundredths below 3.4 feet May 1-16, June 22 to July 31.

Maxima.- May-June 1948: Discharge, 538 second-feet 7:30 a.m. May 4 (gage height, 5.25 feet).

1940 to April 1948: Discharge, 466 second-feet Apr. 19, 1946 (gage height, 5.19 feet).

Remarks.- Some diversion above station for irrigation. No regulation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	260	163	76	11	354	119	63	21	286	112	48
2	244	150	73	12	354	138	61	22	276	109	48
3	256	150	69	13	439	111	58	23	306	122	41
4	464	158	67	14	391	102	56	24	273	124	41
5	372	144	78	15	354	96	53	25	250	113	39
6	400	130	83	16	336	130	51	26	234	104	36
7	410	120	77	17	332	162	49	27	218	98	38
8	410	112	79	18	330	130	48	28	205	91	59
9	400	105	69	19	306	115	50	29	206	85	48
10	363	110	65	20	296	109	53	30	195	80	41
								31	176		37
Monthly mean discharge, in second-feet.....									513	120	56.6
Runoff, in inches.....									4.40	1.63	0.80

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4												
8			4.18	332								
N	4.18	332	4.20	336	4.03	305	3.98	297	3.92	286	3.83	271
4			4.18	332							3.84	273
8	4.21	338										
12	4.18	332	4.09	316	3.98	297	3.95	292	3.89	281	3.92	286
	May 23		May 24		May 25		May 26		May 27		May 28	
4	4.02	304										
8	4.06	311										
N	4.12	322	3.84	273	3.71	251	3.62	236	3.52	220	3.43	206
4												
8												
12	3.93	286	3.76	259	3.65	241	3.54	223	3.46	211	3.38	198
	May 29		May 30		May 31		June 1		June 2		June 3	
4	3.38	198										
8	3.40	201										
N	3.45	209	3.35	194	3.23	176	3.15	164	3.06	151	3.00	143
4	3.47	212										
8	3.48	214									3.13	161
12	3.45	209	3.28	183	3.18	168	3.09	156	3.00	143	3.13	161
	June 4		June 5		June 6		June 7		June 8		June 9	
4	3.09	156										
8												
N	3.11	158	3.00	143	2.91	131	2.83	121	2.77	113	2.71	106
4	3.12	160										
8											2.67	101
12	3.08	154	2.93	134	2.84	122	2.78	115	2.72	107	2.68	103
	June 10		June 11		June 12		June 13		June 14		June 15	
4	2.70	105			3.09	156						
8					3.01	144						
N	2.77	113	2.71	106	2.96	138	2.75	111	2.68	103	2.61	94
4	2.79	116	2.85	121							2.60	93
8			2.96	138	2.84	122					2.67	101
12	2.74	110	3.09	156	2.80	117	2.70	105	2.62	95	2.73	109
	June 16		June 17		June 18		June 19		June 20		June 21	
4	2.77	113	3.28	183								
8	2.79	116										
N	2.79	116	3.12	160	2.90	130	2.79	116			2.77	113
4	2.95	136										
8	3.10	157										
12	3.23	176	2.98	140	2.81	118	2.73	109	2.73	109	2.75	111

Spokane River Basin

## Coeur d'Alene River near Prichard, Idaho

Location.- Lat. 47°38', long. 115°59', in lot 7, sec. 32, T. 50 N., R. 4 E., 0.2 mile downstream from Beaver Creek and 1½ miles southwest of Prichard.

Drainage area.- 596 square miles.

Gage-height record.- Staff gage read once daily to hundredths except May 7, 8, 13, 14, 17, 20-29, when it was read twice daily.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 9,750 second-feet and extended to peak stage by logarithmic plotting.

Maxima.- May-June 1948: Discharge observed, 11,300 second-feet 6 a.m. May 21 (gage height, 9.24 feet).

1944 to April 1948: Discharge observed, 11,700 second-feet Apr. 26, 1946 (gage height, 9.40 feet).

Remarks.- No regulation or diversion above station.

*Mean discharge, in second-feet, 1948*

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	4,850	4,270	1,020	11	5,400	2,460	630	21	11,000	1,820	788
2	4,210	4,060	976	12	4,210	2,270	618	22	10,100	1,660	618
3	3,740	3,850	928	13	6,670	1,790	596	23	9,290	1,530	555
4	4,150	4,060	864	14	7,380	1,920	575	24	10,500	1,400	535
5	4,210	3,910	832	15	6,200	1,720	555	25	9,810	1,370	496
6	4,270	3,430	788	16	5,030	1,720	535	26	9,290	1,350	487
7	7,080	3,220	772	17	7,620	2,340	525	27	8,780	1,310	460
8	7,200	2,960	788	18	7,600	2,270	506	28	8,280	1,220	535
9	6,630	2,700	716	19	6,720	2,070	506	29	6,740	1,170	716
10	5,990	2,700	653	20	9,290	1,920	716	30	5,790	1,100	596
								31	4,680		535
Monthly mean discharge, in second-feet									6,862	2,319	659
Runoff, in inches									15.27	4.34	1.27

*Gage height, in feet, and discharge, in second-feet, at indicated time, 1948*

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
6a	May 17		6	May 25		6a	June 2		6a	June 12	
	7.60	7,080		8.80	10,100		6.00	4,060		4.64	2,270
7p	8.06	8,180	6	8.60	9,550	6a	June 3		6a	June 13	
							5.86	3,850		4.20	1,790
7	May 18		6	May 26		6a	June 4		6a	June 14	
	7.94	7,890		8.60	9,550		6.00	4,060		4.33	1,920
	8:45	7.90		8.40	9,030	6a	June 5			June 15	
12:25	7.82	7,790	6	May 27			5.90	3,910	6a	4.13	1,720
		7,600		8.40	9,030	6a	June 6			June 16	
6a	May 19		6	8.20	8,530		5.56	3,430	6a	4.13	1,720
	7.44	6,720		7.90	7,790	6a	June 7			June 17	
6a	May 20		6	May 28			5.40	3,220	6a	4.70	2,340
	8.10	8,280		8.30	8,780	6a	June 8			June 18	
7p	8.90	10,200	6	7.60	7,080		5.20	2,960	6a	4.64	2,270
				7.30	6,410	6a	June 9			June 19	
6a	May 21		6	May 29			5.00	2,700	6a	4.46	2,070
	9.24	11,300		7.00	5,790	6a	June 10			June 20	
7p	9.00	10,600	6	May 31			5.00	2,700	6a	4.33	1,920
				6.40	4,680	6a	June 11			June 21	
7	May 22		6a	June 1			4.80	2,460	6a	4.23	1,820
	8.94	10,300		6.14	4,270	6a					
6	8.70	9,810	6a								
7	May 23		6a								
	8.40	9,030									
7	8.60	9,550	6a								
6a	May 24		6a								
	9.06	10,800									
7p	8.90	10,200									

## Coeur d'Alene River at Enaville, Idaho

Location.- Lat. 47°34', long. 116°15', in NW¼ sec. 30, T. 49 N., R. 2 E., 800 feet upstream from highway bridge, a quarter of a mile northwest of Enaville post office, 1.1 miles upstream from South Fork, and 3.5 miles downstream from North Fork. Datum of gage is 2,100.00 feet above mean sea level, referenced to bench mark near mouth of North Fork, elevation 2,204.880 (U. S. Geol. Survey Bull. 567, p. 82).

Drainage area.- 895 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 13,100 second-feet and extended to peak stage.

Maxima.- May-June 1948: Discharge, 14,600 second-feet 1 p.m. May 21 (gage height, 69.89 feet).

1939 to April 1948: Discharge, 17,700 second-feet Apr. 15, 1943 (gage height, 71.80 feet).

From local information concerning high-water marks, flood in December 1933 reached a stage of 79.47 feet and that in April 1938 a stage of 78.16 feet.

Remarks.- No appreciable diversion or regulation above station.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	7,180	5,620	1,480	11	7,980	3,130	953	21	14,100	2,380	1,180
2	6,040	5,250	1,390	12	8,060	2,980	924	22	13,600	2,280	960
3	5,300	5,010	1,300	13	9,280	2,720	883	23	12,600	2,110	870
4	5,870	5,210	1,230	14	10,900	2,530	850	24	14,100	1,990	818
5	6,350	4,870	1,220	15	8,950	2,350	830	25	13,700	2,010	762
6	6,520	4,350	1,180	16	7,940	2,370	805	26	13,000	1,920	731
7	9,600	4,030	1,140	17	10,100	2,960	774	27	12,000	1,860	737
8	11,100	3,770	1,130	18	10,900	2,930	755	28	11,300	1,750	938
9	10,200	3,480	1,040	19	9,280	2,720	843	29	9,510	1,630	1,180
10	8,840	3,330	982	20	11,100	2,490	1,260	30	7,540	1,540	1,050
								31	6,220		924
Monthly mean discharge, in second-feet.....									9,650	3,052	1,004
Runoff, in inches.....									12.43	3.81	1.29

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	67.50	8,820	68.57	11,300	67.89	9,700	67.88	9,670	69.51	13,600	69.55	13,700
8	67.80	9,480	68.48	11,100	67.75	9,370	68.21	10,400	69.70	14,100	69.57	13,700
N	68.15	10,300	68.40	10,900	67.64	9,130	68.54	11,200	69.83	14,400	69.60	13,800
4	68.42	10,900	68.32	10,700	67.56	8,950	68.82	11,900	69.86	14,500	69.57	13,700
8	68.56	11,300	68.18	10,400	67.54	8,910	69.09	12,600	69.73	14,200	69.45	13,400
12	68.60	11,400	68.05	10,100	67.65	9,150	69.31	13,100	69.60	13,800	69.32	13,100
	May 23		May 24		May 25		May 26		May 27		May 28	
4	69.17	12,700	69.56	13,700	69.55	13,700	69.36	13,200	68.96	12,200	68.67	11,500
8	69.08	12,500	69.75	14,200	69.58	13,800	69.37	13,200	68.96	12,200	68.73	11,700
N	69.02	12,400	69.87	14,500	69.61	13,800	69.37	13,200	68.93	12,200	68.70	11,600
4	69.03	12,400	69.83	14,400	69.56	13,700	69.29	13,100	68.85	12,000	68.57	11,300
8	69.15	12,700	69.70	14,100	69.49	13,600	69.14	12,700	68.72	11,600	68.39	10,900
12	69.30	13,100	69.58	13,800	69.38	13,300	69.02	12,400	68.65	11,500	68.21	10,400
	May 29		May 30		May 31		June 1		June 2		June 3	
4	68.06	10,100	67.17	8,140	66.28	6,520	65.82	5,730	65.58	5,350	65.35	5,000
8	67.95	9,840	67.00	7,800	66.18	6,350	65.79	5,680	65.57	5,330	65.33	4,960
N	67.84	9,580	66.94	7,500	66.10	6,210	65.79	5,680	65.54	5,280	65.32	4,950
4	67.70	9,260	66.68	7,210	66.01	6,060	65.73	5,590	65.49	5,200	65.36	5,010
8	67.52	8,860	66.54	6,960	65.93	5,920	65.65	5,460	65.44	5,120	65.41	5,090
12	67.34	8,480	66.40	6,720	65.87	5,820	65.60	5,380	65.39	5,040	65.37	5,030
	June 4		June 5		June 6		June 7		June 8		June 9	
4	65.38	5,040	65.37	5,030	65.02	4,480	64.76	4,100	64.57	3,850	64.34	3,530
8	65.49	5,220	65.34	4,980	64.97	4,410	64.75	4,080	64.56	3,830	64.31	3,490
N	65.57	5,350	65.31	4,930	64.93	4,350	64.73	4,060	64.55	3,820	64.29	3,460
4	65.57	5,350	65.21	4,770	64.89	4,290	64.68	3,990	64.49	3,730	64.25	3,410
8	65.49	5,220	65.14	4,660	64.83	4,200	64.64	3,930	64.43	3,650	64.28	3,450
12	65.46	5,170	65.07	4,560	64.78	4,130	64.60	3,870	64.38	3,580	64.25	3,410
	June 10		June 11		June 12		June 13		June 14		June 15	
4	64.28	3,450	64.02	3,110	63.99	3,090	63.73	2,760	63.59	2,590	63.41	2,380
8	64.27	3,440	64.05	3,150	63.95	3,030	63.72	2,750	63.59	2,570	63.38	2,340
N	64.22	3,370	64.06	3,160	63.92	3,000	63.70	2,730	63.54	2,530	63.37	2,330
4	64.13	3,260	64.04	3,140	63.87	2,930	63.67	2,690	63.51	2,500	63.40	2,370
8	64.07	3,180	64.03	3,120	63.81	2,860	63.64	2,650	63.47	2,450	63.36	2,320
12	64.03	3,120	64.02	3,110	63.76	2,800	63.62	2,630	63.43	2,400	63.35	2,310
	June 16		June 17		June 18		June 19		June 20		June 21	
4	63.37	2,330	63.79	2,850	63.91	3,000	63.75	2,800	63.55	2,560	63.41	2,400
8	63.36	2,320	63.91	3,000	63.88	2,960	63.72	2,760	63.52	2,520	63.40	2,390
N	63.35	2,310	63.96	3,060	63.87	2,940	63.69	2,730	63.50	2,500	63.40	2,390
4	63.38	2,340	63.95	3,050	63.83	2,890	63.65	2,680	63.47	2,460	63.39	2,380
8	63.48	2,460	63.93	3,020	63.81	2,870	63.62	2,640	63.43	2,410	63.38	2,370
12	63.56	2,560	63.94	3,030	63.78	2,830	63.58	2,590	63.42	2,400	63.36	2,340

Supplemental record.- May 21, 1 p.m., 69.89 ft., 14,600 sec.-ft.; June 9, 6 p.m., 64.30 ft., 3,480 sec.-ft.



## Coeur d'Alene River near Cataldo, Idaho

Location.- Lat. 47°34', long. 116°18', in sec. 26, T. 49 N., R. 1 E., 1½ miles upstream from Cataldo and 3 miles downstream from South Fork. Datum of gage is 2,100 feet above mean sea level, referenced to bench mark "2143 S" (U. S. Geol. Survey Bull. 567, p. 82).

Drainage area.- 1,220 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge, 18,600 second-feet 10 a.m. to 3 p.m. May 21; gage height, 47.47 feet noon to 2 p.m. May 21.

1911-12, 1920 to April 1948: Discharge, 55,300 second-feet Dec. 22 or 23, 1933 (gage height, 56.9 feet, from floodmark), from rating curve extended above 24,000 second-feet by logarithmic plotting.

Remarks.- No appreciable diversion or regulation above station. Water-stage recorder graph and two discharge measurements furnished by Washington Water Power Co.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	9,300	8,420	2,170	11	10,400	4,580	1,450	21	18,500	3,340	1,790
2	8,010	7,870	2,050	12	10,400	4,290	1,400	22	18,200	3,200	1,490
3	7,220	7,500	1,940	13	12,000	3,910	1,340	23	16,500	3,010	1,320
4	7,930	7,570	1,850	14	13,800	3,630	1,290	24	18,000	2,850	1,250
5	8,290	7,040	1,820	15	11,600	3,380	1,260	25	18,100	2,840	1,150
6	8,490	6,300	1,760	16	10,700	3,430	1,240	26	17,600	2,760	1,090
7	12,100	5,880	1,720	17	13,100	4,060	1,200	27	16,300	2,690	1,090
8	13,900	5,470	1,670	18	14,000	4,020	1,160	28	15,800	2,530	1,420
9	13,000	5,080	1,550	19	12,400	3,760	1,330	29	15,500	2,380	1,760
10	11,400	4,820	1,480	20	14,700	3,490	1,880	30	11,000	2,260	1,560
								31	9,240		1,400
Monthly mean discharge, in second-feet.....									12,750	4,412	1,512
Runoff, in inches.....									12.05	4.03	1.43

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4									47.27	17,900		
8	45.62	12,600	46.19	14,300	45.45	12,100	46.05	13,900	47.41	18,400		
N									47.47	18,600	47.40	18,400
4	46.05	13,900	46.03	13,800	45.42	12,000	46.53	15,400			47.35	18,200
8					45.44	12,100						
12	46.22	14,400	45.62	13,200	45.56	12,400	47.01	17,000	47.40	18,400	47.10	17,300
	May 23		May 24		May 25		May 26		May 27		May 28	
4			47.19	17,600								
8	46.66	16,500	47.32	18,100			47.27	17,900	46.90	16,500	46.83	16,200
N			47.41	18,400	47.37	18,300	47.25	17,800			46.77	16,000
4	46.75	16,100							46.74	16,000		
8	46.80	16,300	47.32	18,100	47.27	17,900	47.02	17,100				
12	47.00	17,000	47.32	18,100	47.26	17,900	47.00	17,000	46.74	16,000	46.39	14,800
	May 29		May 30		May 31		June 1		June 2		June 3	
4												
8	46.18	14,000							44.02	8,010		
N			45.14	10,900	44.50	9,190	44.20	8,440	43.92	7,770	43.77	7,430
4	45.66	13,100									43.82	7,550
8									43.83	7,550	43.80	7,500
12	45.56	12,200	44.76	9,920	44.30	8,680	44.06	8,100				
	June 4		June 5		June 6		June 7		June 8		June 9	
4	43.80	7,500										
8	43.88	7,690	43.60	7,070	43.24	6,280	43.05	5,910	42.88	5,570	42.63	5,100
N	43.86	7,650							42.79	5,390	42.55	4,960
4											42.63	5,100
8											42.59	5,030
12	43.77	7,430	43.39	6,610	43.12	6,030	42.94	5,690	42.70	5,210		
	June 10		June 11		June 12		June 13		June 14		June 15	
4												
8	42.55	4,960	42.36	4,630								
N	42.50	4,870			42.16	4,300	41.91	3,920	41.71	3,640	41.51	3,350
4	42.40	4,690	42.32	4,560								
8												
12	42.31	4,530	42.31	4,540	41.99	4,030	41.80	3,760	41.60	3,480	41.50	3,340
	June 16		June 17		June 18		June 19		June 20		June 21	
4												
8	41.52	3,380	41.85	3,880								
N	41.51	3,360	41.98	4,070								
4	41.49	3,340	42.04	4,170	41.95	4,030	41.77	3,770	41.57	3,490	41.47	3,350
8	41.67	3,590										
12	41.78	3,760	42.01	4,120	41.85	3,880	41.66	3,600	41.49	3,380	41.42	3,280

Supplemental record.- June 9, 6 p.m., 42.63 ft., 5,100 sec.-ft.

## Coeur d'Alene Lake at Coeur d'Alene, Idaho

Location.- Lat. 47°40', long. 116°46', in sec. 24, T. 50 N., R. 4 W., 500 feet southwest of south end of Eleventh Street, Coeur d'Alene. Datum of gage is 2,100.00 feet above mean sea level, referred to originally accepted elevation (2,157.40 feet) of Geological Survey bench mark in southeast corner of Merriam Building (see Water-Supply Paper 882).

Drainage area.- 3,750 square miles.

Gage-height record.- Water-stage recorder graph.

Maxima.- May-June 1948: Gage height, 35.95 feet 3 to 4 p.m. May 30.

1903 to April 1948: Gage height, 39.05 feet Dec. 25, 1933.

Maximum stage known prior to 1903, 37.6 feet May 31, 1894, from high-water marks.

Remarks.- Washington Water Power Co. stores considerable water in lake. Stage regulated by taintor gates and bear-trap dam at Post Falls. Water-stage recorder graph furnished by Washington Water Power Co.

## Mean gage height, in feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	31.57	35.47	28.59	11	32.09	31.82	27.94	21	33.12	28.72	28.01
2	31.45	35.09	28.75	12	32.13	31.51	27.96	22	33.55	28.46	27.97
3	31.27	34.71	28.93	13	32.18	31.17	27.93	23	34.19	28.18	27.95
4	31.09	34.39	27.13	14	32.27	30.82	27.94	24	34.81	27.93	27.93
5	30.93	34.06	27.34	15	32.40	30.44	27.95	25	35.08	27.68	27.91
6	30.82	33.71	27.51	16	32.44	30.10	27.94	26	35.81	27.46	27.93
7	30.80	33.32	27.65	17	32.44	29.81	27.94	27	35.56	27.22	27.96
8	31.11	32.95	27.76	18	32.54	29.51	27.95	28	35.66	26.95	27.97
9	31.59	32.56	27.84	19	32.71	29.21	27.96	29	35.87	26.67	28.00
10	31.93	32.16	27.92	20	32.88	28.94	28.02	30	35.94	26.47	27.96
								31	35.76		27.96

## Spokane River at Post Falls, Idaho

Location.- Lat. 47°42', long. 116°58', in sec. 4, T. 50 N., R. 5 W., 1,500 feet downstream from power plant of Washington Water Power Co., 3,300 feet downstream from intake of Spokane Valley Farms Co.'s canal, and 1 mile west of Post Falls. Datum of gage is 2,000 feet above mean sea level, referenced to same datum as gage on Coeur d'Alene Lake at Coeur d'Alene (see preceding page).

Drainage area.- 3,880 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge, 40,300 second-feet 10 p.m. May 30 (gage height, 78.98 feet).

1913 to April 1948: Maximum discharge, 50,100 second-feet when recorder was not operating Dec. 25, 1933 (determined from unpublished records collected by Washington Water Power Co. for station at Liberty Bridge).

Remarks.- Spokane Valley Farms Co.'s canal and Rathdrum Prairie Canal divert water above gage for irrigation. Flow partly regulated by Coeur d'Alene Lake (see preceding page). Diurnal fluctuation due to power plant operation May 1-24, June 15 to July 31. Water-stage recorder graph and three discharge measurements furnished by Washington Water Power Co.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	25,000	38,400	1,650	11	26,400	25,300	2,130	21	29,500	15,800	4,390
2	24,300	37,000	822	12	26,600	24,500	3,290	22	30,900	15,100	3,540
3	24,100	35,600	283	13	26,800	23,500	2,420	23	33,000	14,400	2,830
4	23,300	34,300	255	14	26,900	22,200	2,170	24	35,400	13,700	2,220
5	22,700	33,200	277	15	27,300	20,800	2,130	25	36,700	13,200	1,200
6	22,400	32,000	618	16	27,300	19,800	2,120	26	37,800	12,700	1,620
7	22,500	30,700	1,300	17	27,400	19,000	1,900	27	38,700	11,900	2,400
8	23,200	29,300	1,150	18	27,600	18,200	1,850	28	39,200	11,500	3,930
9	24,500	27,900	1,390	19	28,200	17,300	2,130	29	39,800	11,000	5,710
10	25,800	26,400	1,520	20	28,600	16,200	2,890	30	40,200	5,680	4,590
								31	39,700		3,540
Monthly mean discharge, in second-feet .....									29,410	21,890	2,202
Runoff, in inches .....									8.74	6.29	0.65

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 23		May 24		May 25		May 26		May 27		May 28	
4					78.09	36,300	78.37	37,600	78.58	38,500	78.72	39,100
8					78.13	36,400	78.40	37,700	78.59	38,600	78.74	39,200
N					78.17	36,600	78.39	37,600	78.62	38,700	78.73	39,200
4					78.22	36,900	78.46	37,900	78.66	38,800	78.73	39,200
8					78.28	37,100	78.50	38,100	78.71	39,000	78.75	39,200
12			78.07	36,200	78.34	37,400	78.55	38,400	78.73	39,200	78.78	39,400
	May 29		May 30		May 31		June 1		June 2		June 3	
4	78.84	39,700	78.94	40,100	78.91	40,000	78.68	38,900	78.37	37,600	78.06	36,100
8	78.87	39,800	78.94	40,100	78.89	39,900	78.64	38,800	78.29	37,200	77.98	35,800
N	78.90	39,900	78.95	40,200	78.86	39,700	78.57	38,400	78.26	37,000	77.90	35,400
4	78.91	40,000	78.96	40,200	78.81	39,500	78.53	38,200	78.21	36,800	77.85	35,200
8	78.93	40,000	78.96	40,200	78.77	39,400	78.46	37,900	78.16	36,600	77.84	35,200
12	78.94	40,100	78.97	40,200	78.73	39,200	78.42	37,800	78.10	36,300	77.80	35,000
	June 4		June 5		June 6		June 7		June 8		June 9	
4	77.75	34,800	77.46	33,500	77.25	32,600	76.94	31,200	76.63	29,800	76.30	28,400
8	77.69	34,500	77.41	33,200	77.18	32,200	76.88	30,900	76.57	29,600	76.24	28,200
N	77.63	34,200	77.38	33,100	77.12	32,000	76.81	30,600	76.50	29,300	76.18	27,900
4	77.57	34,000	77.29	32,800	77.08	31,800	76.77	30,400	76.45	29,000	76.13	27,600
8	77.54	33,900	77.42	33,300	77.02	31,600	76.71	30,200	76.39	28,800	76.07	27,400
12	77.50	33,700	77.30	32,800	76.99	31,400	76.67	30,000	76.35	28,600	76.00	27,100
	June 10		June 11		June 12		June 13		June 14		June 15	
4	75.97	27,000	75.65	25,600	75.47	24,800	75.24	23,800	75.00	22,800		
8	75.91	26,700	75.62	25,400	75.42	24,600	75.22	23,700	74.97	22,700		
N	75.83	26,400	75.58	25,200	75.40	24,500	75.18	23,500	74.88	22,300		
4	75.76	26,000	75.58	25,200	75.36	24,300	75.15	23,400	74.82	22,100		
8	75.72	25,900	75.52	25,000	75.32	24,200	75.09	23,200	74.78	21,900		
12	75.69	25,800	75.50	24,900	75.29	24,000	75.04	23,000	74.30	19,900		

Supplemental record.- May 30, 10 p.m., 78.98 ft., 40,300 sec.-ft.; June 5, 2 p.m., 77.36 ft., 33,000 sec.-ft., 3 p.m., 77.24 ft., 32,500 sec.-ft., 7 p.m., 77.51 ft., 33,700 sec.-ft.; June 14, 10 p.m., 74.75 ft., 21,800 sec.-ft., 11 p.m., 74.09 ft., 19,000 sec.-ft.

## Spokane River at Spokane, Wash.

**Location.**- Lat. 47°39'30", long. 117°26'50", in sec. 13, T. 25 N., R. 42 E., at Cochran Street in Spokane and half a mile upstream from Latah Creek. Datum of gage is about 1,700 feet above mean sea level, subject to correction to datum of 1929.

**Drainage area.**- 4,350 square miles; 3,750 square miles affected by storage in Coeur d'Alene Lake.

**Gage-height record.**- Water-square recorder graph.

**Discharge record.**- Stage-discharge relation defined by current-meter measurements. Gage heights used to hundredths May 17 to June 21; half-tenths below and tenths above 20.2 feet May 1-16 and June 22 to July 31. Shifting-control method used June 1 to July 30.

**Maxima.**- May-June 1948: Discharge, 39,600 second-feet 1:30 a.m. May 31 (gage height, 28.35 feet).

1891 to April 1948: Discharge, 49,000 second-feet (estimated) May 31, 1894.

**Remarks.**- Flow partly regulated by Coeur d'Alene Lake and some diurnal fluctuation caused by power plant at Spokane Falls. Spokane Valley Farms Co.'s canal diverts water for irrigation.

Discharge records for this station are collected in cooperation with Washington Water Power Co.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	25,000	37,900	4,080	11	26,000	26,200	3,080	21	29,000	17,200	4,800
2	24,600	36,500	5,210	12	26,500	25,500	4,260	22	30,200	16,400	4,280
3	24,100	35,000	2,540	13	26,500	24,400	5,820	23	32,400	15,700	5,780
4	23,700	34,000	2,140	14	26,500	23,200	5,040	24	35,000	14,900	5,340
5	22,800	33,000	2,140	15	27,000	22,000	5,240	25	35,700	14,600	2,820
6	22,800	32,100	2,140	16	27,000	21,000	5,130	26	36,700	13,800	2,620
7	22,300	30,900	2,550	17	27,100	20,200	2,980	27	37,600	13,500	2,800
8	23,200	29,700	2,660	18	27,300	19,400	2,850	28	38,300	12,800	4,140
9	24,600	28,400	2,810	19	27,800	18,400	2,980	29	39,100	12,100	5,380
10	25,500	27,100	2,460	20	28,300	17,500	3,650	30	39,500	9,500	5,400
								31	39,300		4,160
Monthly mean discharge, in second-feet									29,080	22,740	3,330
Runoff, in inches									7.71	5.83	0.88

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	25.73	26,100	25.74	26,200	25.84	26,700	25.96	27,200	26.05	27,700	26.25	28,700
8	25.85	26,700	25.87	26,800	26.00	27,400	26.08	27,800	26.18	28,300	26.44	29,600
N	26.04	27,600	26.13	28,100	26.15	28,200	26.26	28,700	26.37	29,200	26.66	30,700
4	25.95	27,200	26.05	27,700	26.13	28,100	26.30	28,900	26.38	29,300	26.66	30,700
8	25.96	27,200	26.04	27,600	26.13	28,100	26.24	28,600	26.41	29,400	26.69	30,800
12	25.96	27,200	26.04	27,600	26.13	28,100	26.25	28,700	26.46	29,700	26.76	31,300
	May 23		May 24		May 25		May 26		May 27		May 28	
4	26.62	30,500	27.20	33,500	27.57	35,400	27.78	36,500	27.90	37,200	28.10	38,300
8	26.80	31,400	27.36	34,300	27.59	35,500	27.80	36,600	27.94	37,400	28.05	38,000
N	27.12	33,100	27.62	35,700	27.64	35,800	27.81	36,700	27.98	37,600	28.11	38,300
4	27.11	33,000	27.59	35,500	27.64	35,800	27.83	36,800	28.00	37,700	28.11	38,300
8	27.26	33,800	27.57	35,400	27.68	36,000	27.84	36,900	28.04	37,900	28.13	38,400
12	27.38	34,400	27.54	35,300	27.72	36,200	27.90	37,200	28.09	38,200	28.20	38,800
	May 29		May 30		May 31		June 1		June 2		June 3	
4	28.19	38,800	28.30	39,400	28.30	39,400	28.20	38,600	28.00	36,700	27.77	35,500
8	28.22	38,900	28.30	39,400	28.30	39,400	28.16	38,300	27.93	36,300	27.74	35,300
N	28.25	39,100	28.32	39,500	28.29	39,300	28.14	38,000	27.93	36,300	27.71	35,100
4	28.28	39,200	28.33	39,500	28.28	39,200	28.11	37,700	27.90	36,200	27.61	34,600
8	28.30	39,400	28.33	39,500	28.23	39,000	28.06	37,200	27.85	35,900	27.62	34,700
12	28.31	39,400	28.33	39,500	28.20	38,800	28.03	36,900	27.80	35,600	27.60	34,600
	June 4		June 5		June 6		June 7		June 8		June 9	
4	27.57	34,400	27.36	33,300	27.19	32,400	26.97	31,300	26.72	30,000	26.48	28,900
8	27.54	34,200	27.32	33,100	27.17	32,300	26.95	31,200	26.70	30,000	26.43	28,600
N	27.48	33,900	27.32	33,100	27.14	32,200	26.91	31,000	26.67	29,800	26.40	28,500
4	27.47	33,900	27.30	33,000	27.10	32,000	26.86	30,800	26.62	29,600	26.34	28,200
8	27.43	33,700	27.20	32,500	27.04	31,700	26.80	30,400	26.56	29,200	26.24	27,700
12	27.40	33,500	27.30	33,000	26.99	31,400	26.74	30,200	26.51	29,000	26.24	27,700
	June 10		June 11		June 12		June 13		June 14		June 15	
4	26.21	27,500	25.96	26,300	25.81	25,600	25.60	24,600	25.39	23,700	24.86	21,300
8	26.19	27,400	25.94	26,200	25.77	25,400	25.56	24,400	25.34	23,400	24.98	21,800
N	26.15	27,200	25.95	26,300	25.75	25,500	25.54	24,400	25.31	23,300	25.26	23,100
4	26.10	27,000	25.94	26,200	25.74	25,300	25.52	24,300	25.25	22,900	25.04	22,100
8	26.03	26,700	25.90	26,000	25.68	25,000	25.48	24,100	25.21	22,800	24.97	21,800
12	25.96	26,300	25.82	25,700	25.64	24,800	25.44	23,900	25.15	22,600	24.90	21,500
	June 16		June 17		June 18		June 19		June 20		June 21	
4	24.60	20,200	24.41	19,400	24.23	18,600	24.04	17,800	23.84	17,000	23.78	16,800
8	24.76	20,900	24.60	20,200	24.41	19,400	24.16	18,300	24.00	17,700	23.85	17,100
N	25.05	22,100	24.87	21,300	24.72	20,700	24.44	19,500	23.98	17,600	24.13	18,200
4	24.80	21,000	24.65	20,400	24.46	19,600	24.18	18,400	24.26	18,700	23.91	17,300
8	24.76	20,900	24.58	20,100	24.34	19,100	24.17	18,400	23.58	15,300	23.80	16,900
12	24.74	20,800	24.48	19,700	24.30	18,900	24.12	18,200	24.10	18,100	23.76	16,700

## Spokane River at Spokane, Wash.--Continued

## Supplemental record:

May	17,	2 a.m., 25.86 ft., 26,800 sec.-ft.;	3 a.m., 25.67 ft., 25,800 sec.-ft.;
	6 a.m., 25.83 ft., 26,600 sec.-ft.;	10 a.m., 26.13 ft., 28,100 sec.-ft.	
18,	2 a.m., 25.96 ft., 27,200 sec.-ft.;	5 a.m., 25.68 ft., 25,900 sec.-ft.;	
	10 a.m., 26.14 ft., 28,100 sec.-ft.;	1 p.m., 26.00 ft., 27,400 sec.-ft.	
19,	10 a.m., 26.28 ft., 28,800 sec.-ft.		
20,	2 a.m., 26.11 ft., 28,000 sec.-ft.;	5 a.m., 25.94 ft., 27,100 sec.-ft.;	
	10 a.m., 26.34 ft., 29,100 sec.-ft.;	2 p.m., 26.20 ft., 28,400 sec.-ft.;	
21,	5 p.m., 26.23 ft., 28,600 sec.-ft.		
	2 a.m., 26.24 ft., 28,600 sec.-ft.;	6 a.m., 26.16 ft., 28,200 sec.-ft.;	
10 a.m., 26.37 ft., 29,200 sec.-ft.;	11 a.m., 26.47 ft., 29,800 sec.-ft.;		
	1 p.m., 26.52 ft., 30,000 sec.-ft.;	2 p.m., 26.37 ft., 29,200 sec.-ft.	
22,	1 a.m., 26.48 ft., 29,800 ft.;	10 a.m., 26.69 ft., 30,800 sec.-ft.;	
	1 p.m., 26.60 ft., 30,400 sec.-ft.		
24,	10 a.m., 27.61 ft., 35,600 sec.-ft.;	1 p.m., 27.69 ft., 36,000 sec.-ft.	
June	31,	1:30 a.m., 28.35 ft., 39,600 sec.-ft.	
	2,	10 a.m., 27.95 ft., 36,400 sec.-ft.	
5,	6 p.m., 27.27 ft., 32,800 sec.-ft.;	7 p.m., 27.17 ft., 32,300 sec.-ft.	
12,	6 p.m., 25.63 ft., 24,800 sec.-ft.		
15,	10 a.m., 25.00 ft., 21,900 sec.-ft.;	11 a.m., 25.29 ft., 23,200 sec.-ft.	
16,	10 a.m., 24.80 ft., 21,000 sec.-ft.		
17,	5 a.m., 24.34 ft., 19,100 sec.-ft.;	10 a.m., 24.62 ft., 20,200 sec.-ft.	
18,	10 a.m., 24.41 ft., 19,400 sec.-ft.		
19,	10 a.m., 24.17 ft., 18,400 sec.-ft.		
20,	5 a.m., 23.81 ft., 16,900 sec.-ft.;	2 p.m., 24.00 ft., 17,700 sec.-ft.;	
	6 p.m., 24.10 ft., 18,100 sec.-ft.;	9 p.m., 23.87 ft., 17,200 sec.-ft.;	
21,	10 p.m., 23.77 ft., 16,800 sec.-ft.		
	2 a.m., 23.80 ft., 16,900 sec.-ft.;	10 a.m., 23.85 ft., 17,100 sec.-ft.	

## Spokane River at Long Lake, Wash.

Location.-- Lat. 47°50', long. 117°50', in SW $\frac{1}{4}$  sec. 13, T. 27 N., R. 39 E., at Long Lake power plant, 12 miles north of Reardon. Datum of gage is 1,300.00 feet above mean sea level, subject to correction to datum of 1929.

Drainage area.-- 6,100 square miles.

Gage-height record.-- Water-stage recorder graph.

Discharge record.-- Stage-discharge relation unstable, affected by backwater. Daily discharges computed from records of power generation.

Maxima.-- May-June 1948: Discharge, 49,400 second-feet 11 p.m. May 24 (gage height, 78.66 feet).

1939 to April 1948: Discharge, 41,800 second-feet May 15, 1946 (gage height, 76.15 feet).

Remarks.-- Water diverted above station for irrigation. Flow affected considerably by power regulation at Long Lake and by Coeur d'Alene Lake. Figures of discharge not adjusted for change in contents of reservoirs. Capacity of Coeur d'Alene Lake between elevations 2,120 and 2,140 feet (lake gage datum), 889,000 acre-feet. Capacity of Long Lake between elevations 1,512 and 1,531 feet, 79,600 acre-feet. Records of discharge furnished by Washington Water Power Co.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	36,100	41,600	5,350	11	28,200	28,400	2,410	21	31,500	16,900	4,270
2	30,300	40,600	4,630	12	29,600	30,900	5,080	22	36,900	16,300	5,280
3	18,400	39,900	4,100	13	30,000	28,800	5,080	23	38,300	15,900	4,310
4	25,200	38,300	1,560	14	31,400	25,800	4,700	24	45,600	16,900	5,140
5	25,800	39,400	3,850	15	35,500	22,900	4,940	25	47,500	13,900	2,860
6	25,600	37,200	3,570	16	32,000	23,000	4,310	26	42,800	18,000	4,370
7	27,300	29,900	4,290	17	26,400	22,600	3,920	27	42,400	16,400	4,440
8	34,200	32,100	4,410	18	28,600	23,300	1,960	28	42,100	13,400	4,390
9	30,800	31,800	4,250	19	29,400	26,600	3,830	29	42,500	13,400	4,680
10	26,300	31,000	4,760	20	32,100	24,100	3,730	30	43,500	10,500	6,270
								31	43,600		5,780
Monthly mean discharge, in second-feet.....									33,520	25,650	4,275
Runoff, in inches.....									6.34	4.69	0.81

## St. Joe River at Calder, Idaho

Location.- Lat. 47°16', long. 116°11', in sec. 3, T. 45 N., R. 2 E., 150 feet southwest of Chicago, Milwaukee, St. Paul & Pacific Railway station at Calder. Datum of gage is 2,100 feet above mean sea level, referenced to original elevation of bench mark "2188 1911 20" (U. S. Geol. Survey Bull. 567). Bench mark has since been moved; revised elevation about 0.86 foot higher.

Drainage area.- 1,080 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge, 23,700 second-feet 6 a.m. May 28 (gage height, 89.04 feet).

1911-12, 1920 to April 1948: Discharge, 53,000 second-feet Dec. 23, 1933 (gage height, 92.5 feet), computed on basis of slope between gages downstream; maximum gage height, 93.1 feet Apr. 18, 1938, from floodmark.

Remarks.- No diversion above station. Water-stage recorder graph furnished by Washington Water Power Co.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	7,370	14,700	2,590	11	7,730	8,710	1,680	21	19,500	4,160	1,600
2	6,480	14,500	2,460	12	8,270	7,520	1,620	22	21,100	3,900	1,370
3	6,270	14,400	2,330	13	11,000	6,800	1,540	23	19,000	3,640	1,280
4	6,880	14,200	2,230	14	11,600	6,200	1,480	24	19,300	3,450	1,240
5	6,400	12,500	2,120	15	9,570	5,680	1,420	25	20,700	3,350	1,180
6	7,370	11,500	2,010	16	10,500	5,510	1,390	26	21,100	3,200	1,120
7	11,200	10,900	2,000	17	13,400	5,170	1,340	27	21,900	3,100	1,180
8	11,400	10,400	1,910	18	14,800	4,750	1,320	28	22,600	2,940	1,980
9	9,600	9,650	1,800	19	14,000	4,410	1,530	29	20,600	2,800	2,150
10	8,300	9,080	1,740	20	17,400	4,150	2,100	30	17,200	2,720	1,680
								31	15,800		1,440
Monthly mean discharge, in second-feet .....									13,490	7,120	1,703
Runoff, in inches .....									14.41	7.36	1.82

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	86.73	13,100	87.19	15,000	86.95	14,000	87.61	16,800	88.31	20,000	88.57	21,400
8	86.85	13,600	87.26	15,200	86.89	13,800	87.73	17,300	88.31	20,000	88.68	21,900
N	86.86	13,600	87.24	15,200	86.82	13,500	87.74	17,400	88.19	19,400	88.64	21,700
4	86.82	13,500	87.16	14,800	86.82	13,500	87.76	17,400	88.06	18,800	88.53	21,200
8	86.85	13,600	87.07	14,500	86.99	14,200	87.91	18,200	88.10	19,000	88.39	20,400
12	87.01	14,200	87.01	14,200	87.31	15,400	88.13	19,200	88.37	20,400	88.23	19,600
	May 23		May 24		May 25		May 26		May 27		May 28	
4	88.13	19,200	88.20	19,500	88.53	21,200	88.64	21,700	88.74	22,200	89.03	23,600
8	88.04	18,800	88.17	19,400	88.54	21,200	88.60	21,500	88.73	22,200	89.03	23,600
N	88.01	18,600	88.13	19,200	88.44	20,700	88.48	20,900	88.62	21,600	88.89	23,000
4	88.06	18,800	88.05	18,800	88.32	20,100	88.36	20,300	88.53	21,200	88.70	22,000
8	88.14	19,200	88.15	19,200	88.38	20,400	88.44	20,700	88.66	21,800	88.59	21,400
12	88.18	19,400	88.39	20,400	88.53	21,200	88.62	21,600	88.90	23,000	88.53	21,200
	May 29		May 30		May 31		June 1		June 2		June 3	
4	88.52	21,100			87.57	16,500	87.27	15,200	87.14	14,700	87.08	14,400
8	88.53	21,200	87.83	17,700			87.21	15,000	87.10	14,500	87.04	14,200
N	88.52	21,100			87.37	15,600	87.13	14,600	87.02	14,200	87.02	14,200
4	88.39	20,400	87.51	16,300	87.27	15,200	87.05	14,300	86.95	13,900	87.03	14,200
8			87.49	16,200			87.05	14,300	87.01	14,200	87.11	14,500
12	88.09	19,000	87.53	16,400	87.30	15,400	87.12	14,600	87.08	14,400	87.22	15,000
	June 4		June 5		June 6		June 7		June 8		June 9	
4	87.19	14,800	86.78	13,200	86.42	11,700	86.31	11,300	86.19	10,900	85.94	10,100
8			86.69	12,800	86.34	11,400	86.23	11,000	86.09	10,500	85.85	9,800
N	87.03	14,200	86.57	12,300	86.23	11,100	86.14	10,700	85.97	10,200	85.74	9,480
4	86.96	13,900	86.49	12,000	86.17	10,800	86.08	10,500	85.90	9,950	85.67	9,280
8					86.25	11,100	86.17	10,800	85.95	10,100	85.72	9,420
12	86.86	13,500	86.47	11,900	86.33	11,400	86.23	11,000	85.97	10,200	85.74	9,480
	June 10		June 11		June 12		June 13		June 14		June 15	
4	85.81	9,660	85.47	8,700	85.21	7,980	84.74	6,850	84.58	6,480		
8	85.78	9,570	85.55	8,910	85.08	7,660	84.68	6,720			84.20	5,700
N	85.57	8,970	85.45	8,640	84.99	7,440	84.68	6,720	84.42	6,140	84.15	5,600
4	85.45	8,640	85.51	8,800	84.69	7,200	84.70	6,770	84.36	6,020	84.15	5,600
8	85.43	8,590	85.47	8,700	84.85	7,100	84.74	6,850			84.16	5,620
12	85.42	8,560	85.37	8,430	84.80	6,990	84.69	6,740	84.30	5,900	84.16	5,620
	June 16		June 17		June 18		June 19		June 20		June 21	
4	84.15	5,580	84.05	5,390	83.78	4,900	83.56	4,530	83.37	4,230	83.30	4,120
8	84.15	5,580	83.96	5,230	83.74	4,840	83.53	4,480	83.34	4,190	83.37	4,230
N	84.09	5,470	83.91	5,140	83.68	4,730	83.49	4,410	83.33	4,170	83.38	4,250
4	84.06	5,410	83.86	5,050	83.64	4,660	83.46	4,360	83.29	4,110	83.33	4,170
8	84.08	5,450	83.82	4,970	83.61	4,610	83.41	4,280	83.26	4,060	83.31	4,140
12	84.11	5,510	83.81	4,960	83.60	4,600	83.39	4,250	83.27	4,070	83.27	4,070

Supplemental record.- May 28, 6 a.m., 89.04 ft., 23,700 sec.-ft.

## St. Maries River at Lotus, Idaho

Location.- Lat. 47°14'40", long. 116°37'30", in sec. 17, T. 45 N., R. 2 W., 1 mile northwest of Lotus, 1 mile downstream from Carlton Creek, and 5½ miles southwest of St. Maries. Datum of gage is 2,140.19 feet above mean sea level, referenced to bench mark "U. S. G. S. 2155 1911 35" (U. S. Geol. Survey Bull. 567, p. 45).

Drainage area.- 437 square miles.

Gage height record.- Staff gage read once daily except May 29, when there was no gage-height record.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 2,410 second-feet and extended to peak stage on basis of slope-area measurement.

Backwater from log jam July 20-29. Discharge for periods of no gage-height record or backwater computed on basis of records for Potlatch Creek at Kendrick and observer's notes.

Shifting-control method used June 22 to July 19, July 30, 31.

Maxima.- May-June 1948: Discharge, 7,500 second-feet May 24 (gage height, about 6.5 feet), by slope-area method.

1911-12, 1920 to April 1948: Discharge observed, 23,800 second-feet Dec. 22, 23, 1933 (gage height, 12.1 feet), from rating curve extended above 4,000 second-feet by logarithmic plotting.

Remarks.- No diversion above station. Staff-gage readings and one discharge measurement furnished by Washington Water Power Co.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,940	2,120	369	11	3,090	1,100	245	21	2,550	682	400
2	1,700	1,840	340	12	2,890	1,020	221	22	2,780	668	210
3	1,530	1,860	317	13	2,950	858	207	23	5,510	595	170
4	2,000	2,060	301	14	2,790	884	194	24	6,410	557	150
5	1,810	1,750	363	15	2,360	732	178	25	4,350	572	140
6	1,890	1,510	312	16	2,290	980	186	26	3,460	542	125
7	2,490	1,290	296	17	2,250	847	182	27	3,060	521	135
8	3,630	1,180	290	18	2,210	666	178	28	2,760	458	440
9	4,300	1,060	259	19	2,010	641	212	29	4,500	406	1,000
10	3,850	951	259	20	2,350	587	300	30	3,140	388	723
								31	2,420	-	506
Monthly mean discharge, in second-feet									2,944	976	297
Runoff, in inches									7.77	2.49	0.78

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
1:50p	May 17 4.13	2,250	1:20p	May 26 4.90	3,460	1:40p	June 4 3.98	2,060	2:45p	June 13 2.83	838
1:45p	May 18 4.10	2,210	1:15p 6 p	May 27 4.67 4.60	3,060 2,950	2p	June 5 3.72	1,750	3:10p	June 14 2.88	884
2:10p	May 19 3.94	2,010	1:10p	May 28 4.48	2,760	2:10p	June 6 3.50	1,510	2:10p	June 15 2.71	732
3:30p	May 20 4.20	2,350	3:05p	May 30 4.72	3,140	2:30p	June 7 3.29	1,290	2:10p	June 16 2.98	980
2:25p	May 21 4.34	2,550	2:10p	May 31 4.25	2,420	2:40p	June 8 3.18	1,180	1:45p 3:15p 4:45p	June 17 2.84 2.83 2.80	847 838 810
1:25p	May 22 4.49	2,780	12:40p 2:25p 3:40p	June 1 4.02 4.03 4.01	2,110 2,120 2,090	2:10p	June 9 3.06	1,060	2:20p	June 18 2.63	666
2:10p	May 23 5.80	5,510	1:50p	June 2 3.80	1,840	3:05p	June 10 2.95	951	2:30p	June 19 2.60	641
10 2:50	May 24 6.26 6.00	6,780 6,050	2:40p	June 3 3.82	1,860	3:10p	June 11 3.10	1,100	1:50p	June 20 2.53	587
2:05p	May 25 5.33	4,350					June 12 3.02	1,020	2:15p	June 21 2.65	682

## Hayden Creek near Hayden Lake, Idaho

Location.- Lat. 47°49'20", long. 116°39'20", in NW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 25, T. 52 N., R. 3 W., 0.35 mile downstream from confluence of North Fork and East Fork, 2 miles upstream from mouth, and 7 miles northeast of Hayden Lake post office. Prior to Apr. 17, 1948, at site 1.5 miles downstream at different datum.

Drainage area.- 22.0 square miles; 26.0 square miles at former site.

Gage-height record.- Staff gage read once or twice daily except May 1, 2, 8, 9, 16, 22, 23, 25, 30, June 6, 7, 13, 20, 21, 27, July 3-5, 11, 18, 25, when there was no gage-height record.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 300 second-feet and extended to peak stage of Apr. 17, 1948, on basis of slope-area measurement. Discharge for periods of no gage-height record interpolated or computed on basis of records for St. Maries River at Lotus and Potlatch Creek near Kendrick.

Maxima.- May-June 1948: Daily discharge, 320 second-feet May 9.

1946 to April 1948: Discharge, 680 second-feet Apr. 17, 1948 (gage height, 4.58 feet, present site and datum, from floodmark), by slope-area method.

Remarks.- No diversion above station.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	110	71	25	11	209	33	18	21	142	33	22
2	98	66	23	12	186	35	17	22	160	32	20
3	87	58	22	13	222	31	17	23	190	31	18
4	90	56	21	14	212	29	16	24	217	35	17
5	92	51	20	15	170	28	15	25	230	35	16
6	136	47	20	16	173	30	14	26	207	32	14
7	207	43	26	17	178	34	14	27	170	31	14
8	260	40	22	18	155	31	13	28	142	30	35
9	320	39	19	19	129	28	13	29	122	28	39
10	256	35	18	20	136	27	26	30	100	26	31
								31	81	-	27
Monthly mean discharge, in second-feet .....									167	37.5	20.4
Runoff, in inches .....									8.77	1.90	1.07

## Hayden Lake at Hayden Lake, Idaho

Location.- Lat. 47°46', long. 116°45', in sec. 18, T. 51 N., R. 3 W., at Avondale and Hayden Lake pumping plants, a quarter of a mile north of Bozanta Tavern. Datum of gage is 2,200.21 feet above mean sea level, datum of 1929.

Gage-height record.- Staff gage read once daily.

Maxima.- May-June 1948: Gage height, 38.19 feet May 30, from floodmark.

1920 to April 1948: Gage height, 40.41 feet Apr. 30 to May 18, 1921.

Maximum stage in 1913 exceeded that of 1948, from information by local residents.

Remarks.- Water is pumped from lake for irrigation and domestic supply.

## Mean gage height, in feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	35.84	38.12	36.74	11	36.94	37.62	36.56	21	37.62	37.14	35.89
2	35.88	38.02	36.72	12	37.04	37.56	36.54	22	37.64	37.10	35.84
3	35.89	37.98	36.64	13	37.34	37.50	36.24	23	37.72	37.08	35.80
4	35.96	37.96	36.62	14	37.38	37.42	36.14	24	37.86	37.04	35.76
5	36.00	37.94	36.58	15	37.40	37.34	36.12	25	37.96	37.04	35.72
6	36.04	37.82	36.54	16	37.44	37.32	36.08	26	38.02	37.00	35.70
7	36.16	37.78	36.54	17	37.48	37.34	36.02	27	38.06	36.96	35.68
8	36.36	37.74	36.50	18	37.52	37.30	35.96	28	38.08	36.92	35.66
9	36.62	37.72	36.44	19	37.60	37.24	35.94	29	38.14	36.88	35.66
10	36.90	37.64	36.42	20	37.62	37.22	35.92	30	38.16	36.84	35.64
								31	38.14		35.64



## Latah Creek at Spokane, Wash.

Location.- Lat. 47°38'50", long. 117°26'58", in SW $\frac{1}{4}$  sec. 24, T. 25 N., R. 42 E., at Spokane, 1 mile above mouth.

Drainage area.- 630 square miles.

Gage-height record.- Graph based on twice-daily gage readings and recorder graphs for nearby streams May 16 to June 21; mean of twice-daily gage readings May 1-15, June 22 to July 31.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 1,700 second-feet and extended to peak stage on basis of slope-area and contracted-opening measurements. Gage heights used to hundredths May 17 to June 21; half-tenths below and tenths above 8.3 feet May 1-16, June 22 to July 31. Shifting-control method used May 1-23.

Maxima.- May-June 1948: Discharge, 11,900 second-feet about 1 a.m. May 24 (gage height, 18.73 feet, from floodmarks).

Remarks.- Diversions for irrigation are probably small percentage of flood discharge.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	395	628	118	11	2,380	252	88	21	1,590	1,270	54
2	335	503	102	12	2,180	659	84	22	1,550	395	50
3	296	478	98	13	3,280	390	76	23	8,020	315	46
4	540	512	93	14	1,730	322	72	24	9,570	260	46
5	490	482	98	15	1,000	263	64	25	3,810	465	50
6	440	398	128	16	700	328	60	26	1,770	296	46
7	570	325	118	17	545	476	57	27	1,080	227	44
8	1,180	273	171	18	476	367	54	28	736	184	50
9	5,370	241	112	19	441	256	54	29	1,630	158	57
10	4,040	466	102	20	1,110	393	57	30	1,580	134	57
								31	826		112
Monthly mean discharge, in second-feet .....									1,925	391	78.0
Runoff, in inches .....									3.52	0.69	0.14

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	9.87	582	9.53	490	9.36	448	10.00	621	11.86	1,590	11.16	1,130
8	9.80	561	9.50	482	9.32	442	10.99	1,040	11.93	1,650	10.81	945
N	9.73	540	9.47	475	9.30	432	11.30	1,220	11.95	1,670	10.64	864
4	9.67	525	9.45	470	9.28	428	11.50	1,340	11.94	1,660	10.30	724
8	9.62	512	9.42	462	9.31	435	11.63	1,430	11.80	1,550	13.20	2,890
12	9.57	500	9.39	455	9.46	472	11.74	1,510	11.50	1,340	14.20	4,140
	May 23		May 24		May 25		May 26		May 27		May 28	
4	15.10	5,110	18.60	11,600	15.56	5,150	15.12	2,100	11.99	1,230	11.20	815
8	16.00	6,280	18.31	10,800	14.89	4,170	12.68	1,880	11.83	1,130	11.05	755
N	16.95	7,700	17.88	9,760	14.37	3,480	12.70	1,730	11.68	1,050	10.95	718
4	17.85	9,690	17.38	8,620	14.00	3,040	12.52	1,590	11.60	1,000	10.87	690
8	18.50	11,300	16.85	7,490	13.68	2,680	12.34	1,460	11.48	945	10.81	668
12	18.72	11,900	16.25	6,330	13.36	2,340	12.17	1,340	11.34	878	10.79	662
	May 29		May 30		May 31		June 1		June 2		June 3	
4	10.95	718	13.04	2,030	11.48	945	10.82	672	10.36	530	10.12	470
8	11.57	990	12.71	1,740	11.28	851	10.76	651	10.28	510	10.12	470
N	12.45	1,540	12.40	1,500	11.17	803	10.69	627	10.23	498	10.11	468
4	13.43	2,410	12.12	1,310	11.07	763	10.63	609	10.18	485	10.11	468
8	13.61	2,600	11.89	1,170	10.98	728	10.55	585	10.15	478	10.24	500
12	13.40	2,380	11.67	1,040	10.89	696	10.46	558	10.14	475	10.29	512
	June 4		June 5		June 6		June 7		June 8		June 9	
4	10.28	510	10.27	508	9.95	428	9.57	349	9.25	287	8.99	241
8	10.26	505	10.22	495	9.87	409	9.50	335	9.22	282	8.97	238
N	10.28	510	10.18	485	9.81	397	9.44	323	9.19	276	8.94	233
4	10.31	518	10.12	470	9.74	383	9.39	313	9.12	264	8.89	226
8	10.30	515	10.07	458	9.68	371	9.34	304	9.07	255	8.93	232
12	10.29	512	10.01	442	9.62	359	9.30	296	9.03	248	8.92	300
	June 10		June 11		June 12		June 13		June 14		June 15	
4	10.32	528	9.12	264	10.75	648	10.02	445	9.55	345	9.19	276
8	10.85	682	9.03	248	11.36	887	9.81	397	9.55	345	9.18	274
N	10.50	570	9.00	243	11.11	779	9.67	369	9.49	333	9.13	265
4	9.88	411	8.98	240	10.81	668	9.58	351	9.36	307	9.06	253
8	9.40	315	8.97	238	10.53	579	9.57	349	9.26	289	9.03	248
12	9.22	282	9.17	272	10.28	510	9.57	349	9.20	278	9.02	246
	June 16		June 17		June 18		June 19		June 20		June 21	
4	9.01	245	9.98	435	9.92	420	9.23	283	8.94	233	12.63	1,670
8	9.01	245	10.03	448	9.74	383	9.14	267	8.98	240	12.98	1,970
N	9.25	287	10.19	468	9.62	359	9.04	250	9.11	262	12.58	1,630
4	9.90	415	10.30	515	9.51	337	8.95	235	9.42	319	11.35	882
8	9.98	435	10.30	515	9.41	317	8.94	233	10.65	615	10.65	615
12	9.99	436	10.13	472	9.31	298	8.93	232	11.85	1,150	10.35	528

Supplemental record.- May 24, 1 a.m., 18.73 ft., 11,900 sec.-ft.

## Little Spokane River near Dartford, Wash.

Location.- Lat. 47°46'47", long. 117°29'36", in NW<sup>1</sup> sec. 3, T. 26 N., R. 42 E., 3 miles upstream from mouth and 4 miles west of Dartford.

Drainage area.- 663 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Gage heights used to hundredths May 17 to June 21; half-tenths May 1-16, June 22 to July 31.

Maximum.- May-June 1948: Discharge, 2,170 second-feet 6 to 8 p.m. May 24 (gage height, 7.12 feet).

Remarks.- Small diversions for domestic use are probably small percentage of flood discharge.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,070	1,240	779	11	1,540	939	646	21	1,240	929	523
2	1,040	1,150	762	12	1,490	1,070	634	22	1,220	1,020	516
3	1,020	1,110	730	13	1,600	1,090	610	23	1,380	1,020	501
4	1,110	1,110	700	14	1,850	993	588	24	1,980	963	494
5	1,340	1,130	700	15	1,660	941	568	25	1,790	963	488
6	1,250	1,090	746	16	1,540	934	558	26	1,490	940	481
7	1,300	1,020	746	17	1,460	1,040	540	27	1,390	916	469
8	1,340	964	746	18	1,380	1,060	532	28	1,300	873	488
9	1,490	927	715	19	1,330	982	523	29	1,340	853	501
10	1,600	898	672	20	1,280	936	532	30	1,560	814	488
								31	1,430		481
Monthly mean discharge, in second-feet.....									1,413	997	595
Runoff, in inches.....									2.46	1.68	1.04

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height		Discharge		Gage height		Discharge		Gage height		Discharge		Gage height		Discharge		Gage height		Discharge		Gage height		Discharge	
	May 17		May 18		May 19		May 20		May 21		May 22		May 23		May 24		May 25		May 26		May 27		May 28	
4	6.60	1,490	6.51	1,400	6.44	1,330	6.40	1,300	6.34	1,250	6.31	1,220												
8	6.58	1,470	6.49	1,380	6.44	1,330	6.39	1,290	6.33	1,240	6.30	1,210												
N	6.57	1,460	6.48	1,370	6.44	1,330	6.38	1,280	6.32	1,230	6.31	1,220												
4	6.56	1,450	6.48	1,370	6.44	1,330	6.38	1,280	6.32	1,230	6.30	1,210												
8	6.54	1,430	6.47	1,360	6.43	1,320	6.37	1,270	6.32	1,230	6.30	1,210												
12	6.52	1,410	6.45	1,340	6.42	1,310	6.36	1,260	6.33	1,240	6.30	1,210												
4	6.35	1,250	6.86	1,800	7.00	1,990	6.64	1,530	6.54	1,430	6.45	1,340												
8	6.41	1,300	6.94	1,910	6.89	1,840	6.62	1,510	6.52	1,410	6.42	1,310												
N	6.48	1,370	7.00	1,990	6.81	1,730	6.59	1,480	6.50	1,390	6.40	1,300												
4	6.54	1,430	7.09	2,120	6.77	1,680	6.58	1,470	6.48	1,370	6.38	1,280												
8	6.61	1,500	7.12	2,170	6.73	1,640	6.57	1,460	6.47	1,360	6.37	1,270												
12	6.73	1,640	7.07	2,100	6.68	1,580	6.55	1,440	6.46	1,350	6.38	1,280												
4	6.40	1,300	6.67	1,570	6.66	1,560	6.38	1,280	6.27	1,190	6.15	1,110												
8	6.42	1,310	6.68	1,580	6.59	1,480	6.36	1,260	6.25	1,180	6.15	1,110												
N	6.43	1,320	6.66	1,560	6.52	1,410	6.33	1,240	6.22	1,150	6.15	1,110												
4	6.45	1,340	6.65	1,540	6.46	1,350	6.32	1,230	6.19	1,130	6.15	1,110												
8	6.51	1,400	6.68	1,580	6.43	1,320	6.30	1,210	6.17	1,120	6.15	1,110												
12	6.59	1,480	6.68	1,580	6.41	1,300	6.28	1,200	6.16	1,110	6.14	1,100												
4	6.14	1,100	6.18	1,130	6.18	1,130	6.04	1,040	5.93	979	5.84	935												
8	6.14	1,100	6.18	1,130	6.16	1,110	6.03	1,030	5.92	973	5.83	930												
N	6.15	1,110	6.19	1,130	6.13	1,090	6.00	1,020	5.90	963	5.82	925												
4	6.16	1,120	6.19	1,130	6.11	1,080	5.98	1,000	5.88	954	5.82	925												
8	6.18	1,130	6.19	1,130	6.07	1,060	5.97	999	5.87	949	5.81	921												
12	6.18	1,130	6.20	1,140	6.06	1,050	5.95	989	5.86	944	5.78	907												
4	5.77	903	5.77	903	5.98	1,000	6.14	1,100	6.00	1,020	5.90	963												
8	5.77	903	5.79	912	6.00	1,020	6.15	1,110	5.97	999	5.88	954												
N	5.76	899	5.84	935	6.12	1,090	6.15	1,110	5.94	984	5.85	940												
4	5.76	899	5.91	968	6.20	1,140	6.13	1,090	5.93	979	5.83	930												
8	5.74	890	5.92	973	6.18	1,130	6.10	1,070	5.92	973	5.81	921												
12	5.73	886	5.97	999	6.15	1,110	6.05	1,040	5.91	968	5.79	912												
4	5.78	907	6.08	1,060	6.10	1,070	5.98	1,000	5.87	949	5.81	921												
8	5.78	907	6.10	1,070	6.10	1,070	5.96	994	5.85	940	5.80	916												
N	5.82	925	6.06	1,050	6.09	1,070	5.93	979	5.83	930	5.81	921												
4	5.87	949	6.03	1,030	6.07	1,060	5.92	973	5.83	930	5.83	930												
8	5.90	963	6.03	1,030	6.03	1,030	5.89	958	5.83	930	5.86	944												
12	5.98	1,000	6.07	1,060	6.00	1,020	5.88	954	5.82	925	5.90	963												

Supplemental record.- May 24, 6 p.m., 7.12 ft., 2,170 sec.-ft.

Okanogan River Basin

Osoyoos Lake near Oroville, Wash.  
(International gaging station)

Location.- Lat. 48°59'15", long. 119°27'15". in lot 1, sec. 8, T. 40 N., R. 27 E., on west shore, 1 mile south of international boundary, and 3 miles north of Oroville.  
Datum of gage is at mean sea level, U. S. Coast and Geodetic Survey datum of 1929.

Drainage area.- 3,250 square miles.

Gage-height record.- Water-stage recorder graph.

Remarks.- Diversion in Canada for irrigation. Elevation may occasionally be affected by dam at Zosel's mill in Oroville and by backwater from Similkameen River, a tributary to Okanogan River. Okanogan River subject to natural regulation in several lakes and to artificial regulation as an aid to navigation in Okanogan Lake. This station is one of the international gaging stations maintained by the United States under agreement with Canada.

Mean elevation\*, in feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	11.59	16.60	12.34	11	11.75	14.59	12.19	21	11.80	13.72	12.07
2	11.63	16.26	12.22	12	11.70	14.56	12.19	22	11.88	13.59	12.05
3	11.66	15.88	12.13	13	11.70	14.52	12.21	23	12.01	13.47	12.04
4	11.71	15.57	12.06	14	11.71	14.37	12.21	24	12.21	13.32	12.00
5	11.70	15.29	12.01	15	11.70	14.20	12.18	25	12.57	13.15	11.99
6	11.75	15.05	11.98	16	11.70	14.07	12.17	26	13.12	13.00	11.97
7	11.77	14.88	12.02	17	11.70	14.04	12.14	27	13.77	12.85	12.01
8	11.78	14.75	12.06	18	11.73	14.04	12.11	28	14.61	12.71	11.99
9	11.75	14.65	12.10	19	11.75	14.00	12.10	29	15.59	12.60	11.96
10	11.76	14.61	12.14	20	11.75	13.85	12.08	30	16.40	12.48	11.96
								31	16.73		11.98

\* Add 900 feet to obtain elevation above mean sea level.

## Okanogan River at Oroville, Wash.

**Location.**- Lat. 48°56', long. 119°25', in SW $\frac{1}{4}$  sec. 27, T. 40 N., R. 27 E., in Oroville, half a mile downstream from Tonasket Creek and 1 $\frac{1}{2}$  miles downstream from Osoyoos Lake. Auxiliary gage 0.4 mile downstream. Datum of gage is 900 feet above mean sea level, datum of 1929.

**Drainage area.**- 3,320 square miles.

**Gage-height record.**- Water-stage recorder graphs from base and auxiliary gages.

**Discharge record.**- Computed by constant-fall method for periods of normal flow and by slope-area method for period of reverse flow. Stage-fall-discharge relations defined by current-meter measurements. Gage heights used to hundredths.

**Maxima.**- May-June 1948: Discharge, 3,480 second-feet 11 a.m. to noon June 2; gage height, 16.53 feet noon to 4 p.m. May 31 (backwater from Similkameen River).  
1942 to April 1948: Discharge, 2,230 second-feet May 17, 1946; gage height, 12.35 feet June 1, 1945 (backwater from Similkameen River).

**Remarks.**- Reverse flow May 25-30 caused by backwater from Similkameen River flowing into Osoyoos Lake. Diversions in Canada for irrigation. Natural regulation in several large lakes and artificial regulation in Okanogan Lake as an aid to navigation.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	901	3,050	1,860	11	1,380	2,040	1,480	21	1,110	2,520	1,450
2	914	3,360	1,760	12	1,410	2,160	1,490	22	1,030	2,430	1,470
3	996	3,170	1,720	13	1,380	2,360	1,500	23	1,190	2,470	1,490
4	1,070	2,900	1,680	14	1,390	2,620	1,580	24	1,160	2,490	1,490
5	1,060	2,700	1,630	15	1,390	2,410	1,600	25	0	2,430	1,460
6	1,210	2,430	1,470	16	1,390	2,410	1,580	26	-636	2,310	1,470
7	1,310	2,190	1,390	17	1,360	2,230	1,570	27	-1,050	2,240	1,500
8	1,300	1,960	1,350	18	1,340	2,200	1,570	28	-1,180	2,030	1,470
9	1,290	1,820	1,370	19	1,340	2,450	1,540	29	-1,900	1,960	1,460
10	1,260	2,050	1,430	20	1,270	2,560	1,460	30	-1,880	1,950	1,440
								31	2,010		1,440
Monthly mean discharge, in second-feet.....									800	2,400	1,522
Runoff, in inches.....									0.28	0.80	0.53

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	7.79	1,380	7.82	1,360	7.87	1,350	7.83	1,300	7.97	1,210	8.85	1,050
N	7.78	1,360	7.82	1,350	7.87	1,350	7.83	1,300	8.02	1,200	9.00	1,110
8	7.78	1,360	7.85	1,380	7.88	1,370	7.83	1,290	8.09	1,090	9.14	1,070
4	7.78	1,350	7.83	1,330	7.87	1,360	7.85	1,270	8.24	1,040	9.32	1,030
N	7.80	1,350	7.83	1,310	7.83	1,300	7.88	1,210	8.45	1,010	9.52	942
12	7.82	1,360	7.83	1,300	7.82	1,290	7.92	1,210	8.67	1,030	9.77	978
	May 23		May 24		May 25		May 26		May 27		May 28	
4	9.98	1,000	10.76	1,140	11.93		12.87		13.55		14.35	
N	10.16	1,060	10.89	1,080	12.20		12.99		13.69		14.51	
8	10.32	1,070	11.11	1,300	12.40		13.10		13.82		14.65	
4	10.47	1,120	11.24	1,280	12.52		13.20		13.93		14.80	
N	10.58	1,230	11.43	1,080	12.62		13.30		14.05		14.93	
12	10.66	1,200	11.67	924	12.73		13.42		14.19		15.12	
	May 29		May 30		May 31		June 1		June 2		June 3	
4	15.30		16.18		16.53	1,480	16.09	2,860	15.47	3,310	15.02	3,320
N	15.48		16.32		16.51	1,960	16.01	3,060	15.38	3,340	14.94	3,290
8	15.65		16.41		16.45	2,240	15.87	3,070	15.32	3,480	14.86	3,140
4	15.80		16.47		16.35	2,350	15.76	3,160	15.23	3,440	14.79	3,060
N	15.93		16.52		16.27	2,700	15.64	3,180	15.14	3,350	14.76	3,050
12	16.07		16.53		16.17	2,680	15.56	3,260	15.08	3,330	14.73	2,960
	June 4		June 5		June 6		June 7		June 8		June 9	
4	14.71	2,900	14.43	2,740	14.31	2,500	14.24	2,260	14.23	2,010	14.23	1,740
N	14.68	2,930	14.38	2,780	14.28	2,490	14.22	2,200	14.23	2,010	14.23	1,840
8	14.64	3,000	14.33	2,760	14.25	2,480	14.20	2,250	14.22	2,070	14.18	1,820
4	14.57	2,850	14.29	2,650	14.22	2,400	14.18	2,190	14.18	1,820	14.13	1,810
N	14.53	2,830	14.29	2,600	14.22	2,350	14.18	2,120	14.20	1,930	14.10	1,900
12	14.49	2,820	14.29	2,550	14.22	2,200	14.20	2,070	14.22	1,830	14.09	1,800
	June 10		June 11		June 12		June 13		June 14		June 15	
4	14.09	1,970	13.98	2,020	13.87	2,100	13.76	2,200	13.27	2,570	12.95	2,490
N	14.05	2,030	14.01	2,020	13.82	2,180	13.72	2,310	13.15	2,610	12.88	2,510
8	14.00	2,140	14.02	2,070	13.77	2,210	13.65	2,430	13.12	2,870	12.81	2,510
4	13.93	2,120	13.98	2,020	13.74	2,200	13.55	2,400	13.03	2,570	12.76	2,500
N	13.92	2,120	13.95	2,010	13.74	2,160	13.48	2,500	13.01	2,560	12.75	2,490
12	13.95	2,060	13.92	2,120	13.75	2,160	13.37	2,530	12.99	2,550	12.75	2,530
	June 16		June 17		June 18		June 19		June 20		June 21	
4	12.67	2,500	12.89	2,240	13.11	2,150	12.83	2,360	12.26	2,560	11.88	2,630
N	12.60	2,460	12.92	2,260	13.12	2,190	12.73	2,450	12.17	2,610	11.79	2,520
8	12.59	2,390	12.98	2,240	13.09	2,180	12.63	2,440	12.10	2,560	11.73	2,520
4	12.62	2,400	13.02	2,200	13.05	2,220	12.54	2,530	12.04	2,530	11.69	2,510
N	12.71	2,320	13.06	2,230	12.99	2,240	12.44	2,510	11.98	2,540	11.68	2,460
12	12.83	2,260	13.09	2,140	12.92	2,300	12.35	2,530	11.93	2,580	11.68	2,440

**Supplemental record.**- June 2, 11 a.m., 15.32 ft., 3,480 sec.-ft.

Okanogan River near Tonasket, Wash.  
(International gaging station)

Location.- Lat. 48°38'00", long. 119°27'50", in lot 3, sec. 8, T. 36 N., R. 27 E., 1,000 feet upstream from Chewiliken Creek and 5½ miles south of Tonasket.

Drainage area.- 7,250 square miles; 2,540 square miles affected by storage in Okanogan Lake.

Gage-height record.- Water-stage recorder graph except for period 11 p.m. May 30 to 10 p.m. May 31 for which graph was drawn based on floodmark and two water-level observations.

Discharge record.- Rating curve defined by current-meter measurements. Gage heights used to hundredths May 17 to June 21; tenths May 1-16 and June 22 to July 31.

Maxima.- May-June 1948: Discharge, 40,900 second-feet 11 a.m. to noon May 31 (gage height, 21.79 feet).

1911-25, 1929 to April 1948: Discharge recorded, 25,400 second-feet Apr. 27, 1934 (gage height, 18.3 feet).

Remarks.- Flow subject to natural regulation by several lakes and to some regulation by Okanogan Lake. Many diversions above station for irrigation.

This station is one of the international gaging stations maintained by the United States under agreement with Canada. Records provisional, subject to revision.

*Mean discharge, in second-feet, 1948*

Day	May	June	July	Day	May	June	July	Day	May	June	July	
1	2,990	37,600	7,770	11	4,840	24,700	5,470	21	7,900	16,600	4,990	
2	2,880	32,903	7,230	12	5,470	24,100	5,310	22	10,800	16,000	4,540	
3	2,880	29,400	6,690	13	5,980	23,000	5,150	23	12,700	15,000	4,400	
4	2,990	27,600	6,150	14	6,330	21,200	4,840	24	14,400	13,500	4,120	
5	3,110	26,300	5,980	15	6,150	19,700	4,690	25	16,900	12,300	4,120	
6	3,110	25,600	5,810	16	6,150	19,000	4,540	26	20,400	11,500	3,850	
7	3,350	25,400	5,640	17	6,240	19,600	4,400	27	23,200	10,600	3,850	
8	3,980	25,500	5,980	18	6,620	20,500	4,260	28	27,000	9,640	3,720	
9	4,260	25,800	6,330	19	7,060	19,700	4,260	29	32,400	9,070	3,720	
10	4,540	25,400	5,810	20	7,190	17,800	4,840	30	38,000	8,500	3,720	
									31	40,500		3,590
Monthly mean discharge, in second-feet .....									10,980	20,450	5,020	
Runoff, in inches .....									1.75	3.15	0.80	

*Gage height, in feet, and discharge, in second-feet, at indicated time, 1948*

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	9.69	6,130	9.87	6,460	10.12	6,910	10.27	7,180	10.36	7,340	11.77	9,980
8	9.75	6,240	9.91	6,530	10.18	7,010	10.27	7,180	10.43	7,460	12.03	10,500
N	9.77	6,280	9.96	6,620	10.22	7,090	10.28	7,190	10.55	7,680	12.24	10,900
4	9.77	6,280	10.01	6,710	10.26	7,160	10.28	7,190	10.67	7,900	12.39	11,200
8	9.79	6,310	10.06	6,800	10.28	7,190	10.28	7,190	11.20	8,880	12.51	11,500
12	9.82	6,370	10.09	6,850	10.28	7,190	10.30	7,230	11.52	9,490	12.64	11,800
	May 23		May 24		May 25		May 26		May 27		May 28	
4	12.75	12,000	13.60	14,000	14.26	15,600	15.66	19,400	16.60	22,200	17.63	25,500
8	12.91	12,400	13.69	14,200	14.45	16,100	15.84	20,000	16.74	22,700	17.81	26,100
N	13.08	12,700	13.78	14,400	14.64	16,600	16.00	20,400	16.90	23,200	18.06	26,900
4	13.23	15,100	13.86	14,600	14.99	17,500	16.13	20,800	17.06	23,700	18.30	27,700
8	13.38	15,400	13.99	14,900	15.25	18,300	16.28	21,300	17.25	24,300	18.59	28,700
12	13.51	15,700	14.12	15,200	15.47	18,900	16.45	21,800	17.42	24,800	18.80	29,500
	May 29		May 30		May 31		June 1		June 2		June 3	
4	19.08	30,500	20.55	35,900	21.70	40,500	21.37	39,200	20.14	34,400	19.04	30,300
8	19.34	31,400	20.84	37,000	21.77	40,800	21.19	38,400	19.94	33,600	18.90	29,800
N	19.66	32,600	21.14	38,200	21.79	40,900	21.00	37,700	19.74	32,900	18.76	29,300
4	19.88	33,400	21.34	39,000	21.73	40,600	20.79	36,900	19.56	32,200	18.67	29,000
8	20.07	34,100	21.46	39,500	21.64	40,200	20.60	36,100	19.37	31,500	18.55	28,600
12	20.26	34,700	21.60	40,100	21.50	39,700	20.37	35,200	19.19	30,900	18.44	28,200
	June 4		June 5		June 6		June 7		June 8		June 9	
4	18.36	27,900	18.06	26,900	17.67	25,600	17.60	25,400	17.59	25,400	17.69	25,700
8	18.30	27,700	18.00	26,700	17.66	25,600	17.61	25,400	17.60	25,400	17.70	25,700
N	18.26	27,600	17.94	26,500	17.66	25,600	17.62	25,500	17.64	25,500	17.72	25,800
4	18.24	27,500	17.84	26,200	17.68	25,700	17.62	25,500	17.65	25,600	17.73	25,800
8	18.19	27,400	17.76	25,900	17.64	25,500	17.60	25,400	17.68	25,700	17.73	25,800
12	18.13	27,200	17.70	25,700	17.62	25,500	17.59	25,400	17.66	25,600	17.72	25,800
	June 10		June 11		June 12		June 13		June 14		June 15	
4	17.70	25,700	17.40	24,800	17.36	24,600	16.95	23,300	16.61	22,300	15.88	20,100
8	17.65	25,600	17.34	24,600	17.30	24,400	16.92	23,200	16.49	21,900	15.84	20,000
N	17.64	25,500	17.36	24,600	17.24	24,200	16.90	23,000	16.34	21,400	15.79	19,800
4	17.58	25,300	17.39	24,700	17.16	24,000	16.86	23,000	16.17	20,900	15.74	19,700
8	17.50	25,100	17.40	24,800	17.06	23,800	16.80	22,800	16.04	20,500	15.67	19,500
12	17.46	24,900	17.39	24,700	17.00	23,500	16.71	22,600	15.94	20,200	15.61	19,300
	June 16		June 17		June 18		June 19		June 20		June 21	
4	15.60	19,300	15.50	19,000	15.95	20,200	15.99	20,400	15.34	18,500	14.77	16,900
8	15.56	19,100	15.60	19,300	15.97	20,300	15.91	20,200	15.23	18,200	14.72	16,800
N	15.54	19,000	15.67	19,500	16.04	20,500	15.80	19,800	15.12	17,900	14.67	16,700
4	15.50	19,000	15.74	19,700	16.07	20,600	15.68	19,500	15.01	17,600	14.60	16,500
8	15.47	18,900	15.80	19,800	16.06	20,600	15.56	19,100	14.91	17,300	14.52	16,300
12	15.47	18,900	15.86	20,000	16.04	20,500	15.46	18,900	14.86	17,200	14.47	16,200

Supplemental record.- May 21, 6 p.m., 10.73 ft., 8,000 sec.-ft.; May 31, 11 a.m., 21.79 ft., 40,500 sec.-ft.

Similkameen River near Nighthawk, Wash.  
(International gaging station)

**Location.**— Lat. 48°59'10", long. 119°37'00", in NW¼ sec. 7, T. 40 N., R. 26 E., about 1½ miles downstream from Nighthawk and 12 miles upstream from mouth.

**Drainage area.**— 3,420 square miles.

**Gage-height record.**— Water-stage recorder graph.

**Discharge record.**— Stage-discharge relation defined by current-meter measurements.

Gage heights used to hundredths May 17 to June 21; half-tenths below and tenths above 6.1 feet May 1-16, June 21 to July 31.

**Maxima.**— May-June 1948: Discharge, 38,700 second-feet 10 a.m. May 30 (gage height, 17.62 feet).

1928 to April 1948: Discharge, 27,200 second-feet Apr. 26, 1934 (gage height, 14.96 feet).

**Remarks.**— Flow regulated by natural diversion into and release from Palmer Lake. Small diversions above station for irrigation. This station is an international gaging station maintained by the United States under agreement with Canada. Records provisional, subject to revision.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2,090	29,200	5,780	11	4,280	22,100	4,130	21	9,030	13,500	3,560
2	2,040	25,600	5,250	12	4,910	20,700	3,980	22	11,900	13,100	3,300
3	2,040	23,900	4,910	13	5,250	19,600	3,700	23	14,300	11,500	3,040
4	2,090	23,300	4,590	14	5,250	17,200	3,560	24	16,200	10,500	2,910
5	2,200	22,500	4,430	15	5,080	16,500	3,300	25	20,700	9,510	2,850
6	2,310	22,700	4,430	16	5,250	16,400	3,170	26	23,300	8,830	2,610
7	2,800	23,000	4,430	17	5,550	18,000	3,040	27	27,000	8,170	2,490
8	3,430	23,700	5,080	18	6,100	18,100	2,910	28	31,800	7,330	2,490
9	3,560	23,500	4,910	19	6,350	15,800	3,300	29	37,000	6,930	2,610
10	3,840	22,100	4,280	20	6,730	14,200	3,980	30	38,100	6,340	2,430
								31	34,600		2,260
Monthly mean discharge, in second-feet .....									11,130	17,130	3,668
Runoff, in inches .....									3.75	5.59	1.24

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	7.57	5,370	7.87	5,910	8.13	6,400	8.10	6,340	8.86	7,880	10.25	11,100
8	7.59	5,400	7.89	5,940	8.10	6,340	8.09	6,320	9.03	8,240	10.36	11,400
N	7.62	5,460	7.92	6,000	8.08	6,300	8.19	6,510	9.32	8,870	10.50	11,700
4	7.72	5,640	8.05	6,240	8.09	6,320	8.40	6,930	9.67	9,670	10.70	12,300
8	7.81	5,800	8.11	6,360	8.11	6,360	8.59	7,310	9.94	10,300	10.89	12,800
12	7.85	5,870	8.13	6,400	8.11	6,360	8.73	7,600	10.12	10,800	11.06	13,300
	May 23		May 24		May 25		May 26		May 27		May 28	
4	11.22	13,800	11.64	15,100	13.08	20,000	13.75	22,400	14.63	25,800	15.65	29,900
8	11.33	14,100	11.75	15,400	13.28	20,700	13.67	22,900	14.80	26,500	15.86	30,800
N	11.42	14,400	11.90	15,900	13.33	20,900	13.95	23,200	14.90	26,900	16.06	31,700
4	11.47	14,500	12.10	16,600	13.37	21,000	14.03	23,500	15.05	27,500	16.26	32,500
8	11.51	14,700	12.35	17,400	13.45	21,500	14.22	24,200	15.22	28,200	16.51	33,600
12	11.56	14,800	12.79	18,900	13.59	21,800	14.45	25,100	15.51	29,300	16.80	34,900
	May 29		May 30		May 31		June 1		June 2		June 3	
4	17.02	35,900	17.49	38,100	17.17	36,600	15.89	30,900	14.82	26,500	14.30	24,500
8	17.20	36,700	17.61	38,600	16.95	35,600	15.68	30,100	14.69	26,000	14.18	24,000
N	17.32	37,300	17.60	38,600	16.72	34,600	15.42	29,000	14.54	25,400	14.07	23,600
4	17.42	37,700	17.53	38,200	16.49	33,500	15.23	28,200	14.43	25,000	14.02	23,400
8	17.50	38,100	17.45	37,800	16.27	32,600	15.08	27,600	14.39	24,900	14.06	23,600
12	17.48	38,000	17.31	37,200	16.09	31,800	14.94	27,000	14.35	24,700	14.11	23,800
	June 4		June 5		June 6		June 7		June 8		June 9	
4	14.11	23,800	13.81	22,600	13.86	22,800	13.91	23,000	14.08	23,700	14.21	24,200
8	14.02	23,400	13.73	22,300	13.80	22,600	13.86	22,800	14.06	23,600	14.09	23,700
N	13.99	23,300	13.70	22,200	13.76	22,500	13.85	22,800	14.03	23,500	14.00	23,400
4	13.94	23,100	13.72	22,300	13.76	22,500	13.89	22,900	14.05	23,600	13.94	23,100
8	13.91	23,000	13.80	22,600	13.84	22,800	13.98	23,300	14.14	23,900	13.93	23,100
12	13.86	22,800	13.86	22,800	13.91	23,000	14.04	23,500	14.22	24,200	13.91	23,000
	June 10		June 11		June 12		June 13		June 14		June 15	
4	13.81	22,600	13.75	22,400	13.36	21,000	13.28	20,700	12.37	17,500	12.16	16,800
8	13.66	22,100	13.75	22,400	13.27	20,600	13.14	20,200	12.24	17,000	12.06	16,400
N	13.55	21,700	13.70	22,200	13.23	20,500	12.95	19,500	12.20	16,900	12.00	16,200
4	13.53	21,600	13.63	22,000	13.23	20,500	12.81	19,000	12.24	17,000	12.04	16,400
8	13.59	21,800	13.56	21,700	13.29	20,700	12.69	18,600	12.26	17,100	12.07	16,500
12	13.70	22,200	13.47	21,400	13.33	20,900	12.54	18,000	12.24	17,000	12.00	16,200
	June 16		June 17		June 18		June 19		June 20		June 21	
4	11.90	15,900	12.42	17,600	12.68	18,500	12.11	16,600	11.43	14,400	11.16	13,600
8	11.85	15,700	12.46	17,800	12.66	18,500	11.95	16,100	11.36	14,200	11.12	13,500
N	11.95	16,100	12.50	17,900	12.60	18,300	11.83	15,700	11.34	14,100	11.00	13,100
4	12.12	16,600	12.56	18,100	12.50	17,900	11.75	15,400	11.30	14,000	11.11	13,400
8	12.30	17,200	12.64	18,400	12.40	17,600	11.66	15,100	11.26	13,900	11.14	13,500
12	12.40	17,600	12.67	18,500	12.27	17,100	11.55	14,800	11.21	13,800	11.16	13,600

**Supplemental record.**— May 29, 10 p.m., 17.52 ft., 38,200 sec.-ft.; May 30, 2 a.m., 17.43 ft., 37,800 sec.-ft., 7 a.m., 17.53 ft., 38,200 sec.-ft., 10 a.m., 17.62 ft., 38,700 sec.-ft.; June 13, 2 a.m., 13.33 ft., 20,900 sec.-ft.

## Methow River Basin

Methow River at Twisp, Wash.

**Location.**- Lat. 48°21'40", long. 120°06'50", in sec. 17, T. 33 N., R. 22 E., at highway bridge at Twisp, a quarter of a mile downstream from Twisp River. (See pl. 11A.)

**Drainage area.**- 1,330 square miles.

**Gage-height record.**- Water-stage recorder graph except 8 a.m. July 30 to July 31 for which gage heights were interpolated.

**Discharge record.**- Stage-discharge relation defined by current-meter measurements below 10,000 second-feet and extended to peak stage on basis of slope-area measurement.

Shifting-control method used 12 p.m. May 28 to 2 p.m. May 29. Gage heights used to hundredths May 17 to June 21; half-tenths below and tenths above 4.0 feet May 1-17, June 22 to July 30.

**Maxima.**- May-June 1948: Discharge, 40,800 second-feet 2 p.m. May 29 (gage height, 12.94 feet), by slope-area method.

1919-29, 1933 to April 1948: Discharge, 21,300 second-feet May 26, 1942 (gage height, 10.76 feet).

**Remarks.**- Diversions above station for irrigation are probably a small percentage of flood discharge.

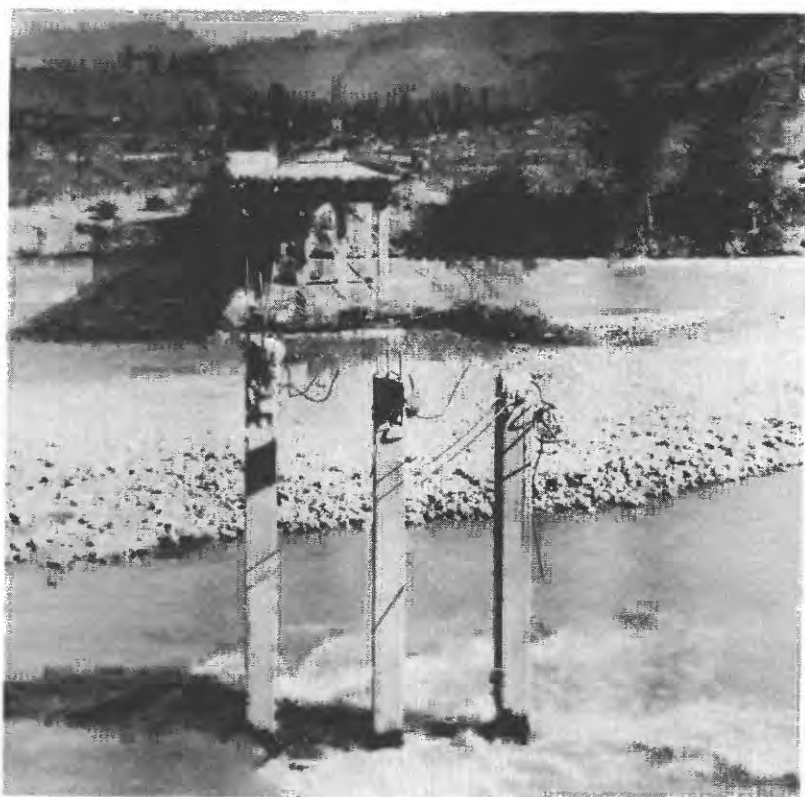
## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,450	9,050	3,140	11	1,980	11,000	2,100	21	4,900	6,970	1,970
2	1,350	8,920	2,770	12	2,160	10,500	2,100	22	7,000	6,210	1,810
3	1,400	9,220	2,550	13	2,460	8,780	1,890	23	8,580	5,590	1,700
4	1,500	9,900	2,340	14	2,350	8,480	1,810	24	10,100	5,210	1,620
5	1,450	10,500	2,290	15	2,280	7,870	1,770	25	10,700	4,840	1,520
6	1,500	10,300	2,550	16	2,280	9,320	1,730	26	12,400	4,500	1,430
7	1,650	10,600	2,600	17	2,390	11,000	1,730	27	14,800	4,170	1,400
8	1,700	9,840	2,600	18	2,590	9,180	1,730	28	18,600	4,010	1,350
9	1,760	10,000	2,340	19	2,770	7,900	2,100	29	32,500	3,850	1,300
10	1,920	10,400	2,200	20	3,160	7,490	2,060	30	17,800	3,700	1,300
								31	10,000		1,300
Monthly mean discharge, in second-feet									6,052	7,990	1,972
Runoff, in inches									5.25	6.70	1.71

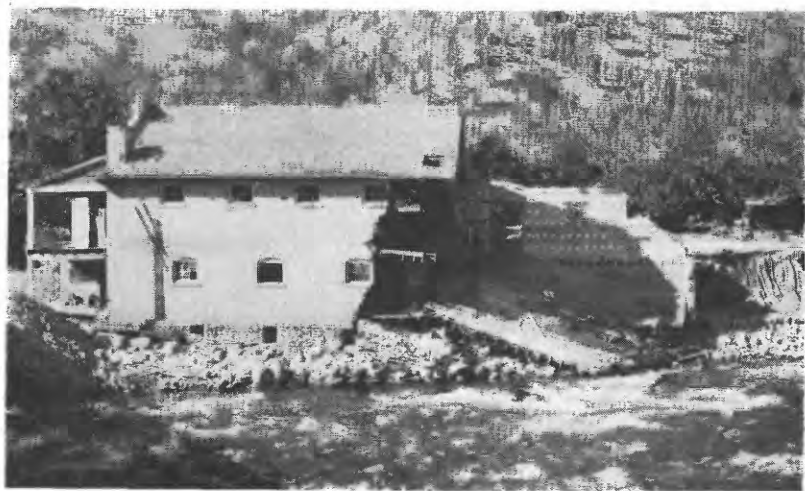
## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height		Discharge		Gage height		Discharge		Gage height		Discharge		Gage height		Discharge		Gage height		Discharge		Gage height		Discharge	
	May 17		May 18		May 19		May 20		May 21		May 22		May 23		May 24		May 25		May 26		May 27		May 28	
4	4.30	2,350	4.44	2,540	4.59	2,750	4.69	2,890	5.51	4,280	6.63	6,580												
8	4.33	2,390	4.48	2,590	4.61	2,770	4.77	3,000	5.70	4,660	6.79	6,920												
N	4.34	2,400	4.51	2,630	4.63	2,800	4.86	3,140	5.66	4,980	6.86	7,070												
4	4.35	2,420	4.50	2,620	4.62	2,790	4.95	3,280	5.93	5,120	6.88	7,120												
8	4.36	2,430	4.49	2,610	4.62	2,790	5.06	3,460	6.08	5,430	6.99	7,360												
12	4.37	2,440	4.53	2,660	4.64	2,820	5.26	3,810	6.38	6,060	7.23	7,890												
	May 23		May 24		May 25		May 26		May 27		May 28													
4	7.42	8,300	8.25	10,200	8.39	10,500	9.04	12,000	9.87	14,200	11.02	17,400												
8	7.48	8,440	8.35	10,400	8.51	10,800	9.23	12,500	10.17	14,900	11.47	18,700												
N	7.52	8,520	8.32	10,300	8.52	10,800	9.30	12,700	10.25	15,200	11.63	19,200												
4	7.55	8,590	8.17	9,980	8.41	10,500	9.21	12,500	10.17	14,900	11.59	19,100												
8	7.71	8,940	8.11	9,840	8.44	10,600	9.26	12,600	10.24	15,100	11.62	19,200												
12	7.97	9,520	8.25	10,200	8.72	11,300	9.54	13,300	10.60	16,100	11.77	19,600												
	May 29		May 30		May 31		June 1		June 2		June 3													
4	12.27	25,500	10.19	23,600	7.32	11,600	6.64	9,530	6.58	9,350	6.65	9,560												
8	12.66	31,700	9.40	19,600	7.04	10,700	6.80	9,410	6.54	9,240	6.72	9,760												
N	12.83	37,600	8.78	17,000	6.61	9,440	6.52	9,190	6.43	8,940	6.48	9,080												
4	12.76	39,500	8.00	13,900	6.45	9,000	6.28	8,540	6.24	8,430	6.37	8,780												
8	12.20	35,600	7.74	12,900	6.36	8,750	6.23	8,410	6.26	8,490	6.40	8,860												
12	11.08	28,500	7.45	12,000	6.62	9,470	6.44	8,970	6.51	9,160	6.59	9,380												
	June 4		June 5		June 6		June 7		June 8		June 9													
4	6.64	9,530	7.18	11,100	7.19	11,200	7.24	11,300	6.92	10,400	6.84	10,100												
8	6.74	9,820	6.94	10,400	7.07	10,800	6.94	10,400	6.76	9,880	6.85	10,200												
N	6.77	9,910	6.73	9,790	6.88	10,200	6.71	9,730	6.56	9,300	6.83	10,100												
4	6.64	9,530	6.76	9,880	7.00	10,600	6.86	10,200	6.60	9,410	6.81	10,000												
8	6.94	10,400	7.07	10,800	7.27	11,400	7.05	10,800	6.67	9,610	6.74	9,820												
12	7.14	11,000	7.21	11,200	7.33	11,600	7.03	10,700	6.86	10,200	6.70	9,700												
	June 10		June 11		June 12		June 13		June 14		June 15													
4	6.86	10,200	7.23	11,300	7.18	11,100	6.58	9,350	6.41	8,890	6.12	8,120												
8	6.93	10,400	7.20	11,200	7.06	10,800	6.42	8,910	6.38	8,810	5.99	7,800												
N	6.96	10,500	7.20	11,200	6.96	10,500	6.30	8,590	6.31	8,620	5.97	7,740												
4	6.98	10,500	7.05	10,800	6.80	10,000	6.20	8,330	6.12	8,120	5.93	7,640												
8	6.98	10,500	6.97	10,500	6.64	9,530	6.23	8,410	6.11	8,100	6.03	7,900												
12	7.06	10,800	7.06	10,800	6.62	9,470	6.33	8,670	6.10	8,070	6.06	7,970												
	June 16		June 17		June 18		June 19		June 20		June 21													
4	6.10	8,070	7.14	11,000	6.74	9,820	6.10	8,070	5.98	7,770	5.74	7,190												
8	6.14	8,170	7.25	11,400	6.62	9,470	6.08	8,020	5.97	7,740	5.73	7,170												
N	6.46	9,020	7.22	11,300	6.50	9,130	6.02	7,870	5.83	7,400	5.67	7,030												
4	6.86	10,200	7.18	11,100	6.39	8,830	5.98	7,770	5.79	7,310	5.60	6,870												
8	7.13	11,000	7.02	10,700	6.27	8,510	5.92	7,620	5.76	7,240	5.52	6,690												
12	7.11	10,900	6.90	10,300	6.22	8,380	5.97	7,740	5.74	7,190	5.46	6,550												

**Supplemental record.**- May 29, 2 p.m., 12.94 ft., 40,800 sec.-ft.



A. BRIDGE OVER METHOW RIVER NEAR CARLTON, WASH.



B. BUILDING DAMAGED BY ENTIAT RIVER ABOUT 5 MILES ABOVE MOUTH.





## Chelan River Basin

Stehekin River at Stehekin, Wash.

Location.- Lat. 48°19'50", long. 120°41'40", in SE¼ sec. 26, T. 33 N., R. 17 E., 1,200

feet upstream from Boulder Creek and 2 miles upstream from Lake Chelan and Stehekin.

Drainage area.- 372 square miles, including that of Boulder Creek.

Gage-height record.- Water-stage recorder graph except for May 1, 2, when there was no gage-height record.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 8,400 second-feet and extended to peak stage on basis of slope-area measurement.

Gage heights used to hundredths May 17 to June 21; half-tenths below and tenths above 22.3 feet May 1 to 16, June 22 to July 31. Shifting-control method used May 28. Discharge for period of no gage-height record computed on basis of records for nearby streams and weather records.

Maxima.- May-June 1948: Discharge, 18,600 second-feet 2 a.m. May 29 (gage height, 29.00 feet), by slope-area method.

1910-15, 1927 to April 1948: Discharge, 12,900 second-feet June 2, 1936 (gage height, 27.18 feet).

Remarks.- Flood flow not affected by diversion or storage. Gage-height record collected in cooperation with Washington Water Power Co., which furnished some discharge measurements.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,080	6,010	2,980	11	1,730	7,650	2,060	21	3,960	4,420	2,000
2	1,080	5,890	2,560	12	1,780	5,930	1,900	22	5,160	3,870	2,000
3	1,080	6,140	2,440	13	1,880	5,270	1,850	23	5,600	3,730	1,900
4	1,040	6,030	2,350	14	1,780	4,940	1,900	24	6,290	3,590	1,610
5	1,080	7,040	2,110	15	1,780	4,640	2,060	25	7,060	3,450	1,480
6	1,250	7,980	2,380	16	1,780	4,910	2,280	26	8,810	3,450	1,480
7	1,580	9,370	2,280	17	2,020	5,050	2,350	27	11,200	3,590	1,700
8	1,430	9,260	1,950	18	2,170	4,360	2,440	28	16,000	3,870	1,520
9	1,530	8,590	1,800	19	2,200	4,540	2,280	29	15,400	4,020	1,560
10	1,630	8,990	1,950	20	2,620	4,640	2,060	30	8,200	3,590	1,660
								31	6,400		1,700
Monthly mean discharge, in second-feet									4,077	5,494	2,018
Runoff, in inches									12.64	16.48	6.25

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Gage height, in feet, and discharge, in second-feet, at indicated time, 1950																				
Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge				
	May 17		May 18		May 19		May 20		May 21		May 22									
4	21.42	1,960	21.61	2,170	21.67	2,240	21.72	2,300	22.71	3,620	23.65	5,150								
8	21.42	1,960	21.59	2,150	21.64	2,210	21.79	2,390	22.74	3,660	23.61	5,080								
N	21.42	1,960	21.56	2,120	21.62	2,180	21.84	2,450	22.72	3,630	23.56	4,990								
4	21.48	2,030	21.59	2,150	21.62	2,180	21.99	2,630	22.95	3,980	23.59	5,040								
8	21.58	2,140	21.66	2,230	21.62	2,180	22.34	3,090	23.34	4,620	23.79	5,400								
12	21.62	2,180	21.67	2,240	21.66	2,230	22.61	3,460	23.57	5,010	23.92	5,640								
	May 23		May 24		May 25		May 26		May 27		May 28									
4	23.89	5,580	24.31	6,360	24.56	6,850	25.34	8,480	26.27	10,600	28.19	15,800								
8	23.79	5,400	24.19	6,130	24.43	6,590	25.15	8,060	26.06	10,100	28.34	16,400								
N	23.73	5,290	24.04	5,850	24.30	6,340	25.05	7,860	25.91	9,770	27.92	15,200								
4	23.80	5,420	24.10	5,960	24.50	6,730	25.37	8,540	26.40	11,000	28.01	15,600								
8	24.06	5,890	24.43	6,590	25.06	7,880	26.07	10,200	27.19	13,000	28.52	17,100								
12	24.31	6,360	24.81	7,350	25.38	8,570	26.39	10,900	27.54	14,000	28.90	18,300								
	May 29		May 30		May 31		June 1		June 2		June 3									
4	28.91	18,300	25.59	9,430	24.26	6,650	24.07	6,300	23.91	6,010	24.18	6,500								
8	28.47	17,000	25.25	8,670	24.08	6,310	23.90	5,990	23.75	5,720	24.01	6,190								
N	27.99	15,600	24.68	7,480	23.92	6,030	23.73	5,680	23.60	5,460	23.91	6,010								
4	27.40	14,000	24.55	7,220	23.96	6,100	23.73	5,680	23.64	5,530	23.85	5,900								
8	26.91	12,600	24.57	7,260	24.14	6,430	23.91	6,010	24.04	6,240	23.89	5,970								
12	26.33	11,200	24.48	7,080	24.25	6,640	24.00	6,170	24.20	6,540	23.90	5,990								
	June 4		June 5		June 6		June 7		June 8		June 9									
4	23.82	5,850	24.52	7,160	24.83	7,780	25.56	9,360	25.90	10,100	25.50	9,220								
8	23.70	5,630	24.35	6,820	24.62	7,360	25.30	8,780	25.43	9,070	25.10	8,350								
N	23.59	5,440	24.12	6,390	24.46	7,040	25.10	8,350	25.02	8,180	24.74	7,600								
4	23.80	5,810	24.21	6,560	24.75	7,620	25.41	9,020	25.14	8,430	24.86	7,850								
8	24.36	6,840	24.76	7,640	25.50	9,220	26.00	10,400	25.61	9,470	25.35	8,890								
12	24.56	7,240	24.97	8,080	25.71	9,700	26.21	10,900	25.73	9,750	25.65	9,560								
	June 10		June 11		June 12		June 13		June 14		June 15									
4	25.61	9,470	25.06	8,270	24.14	6,430	23.54	5,360	23.42	5,150	23.21	4,810								
8	25.54	9,310	24.83	7,780	23.96	6,100	23.46	5,220	23.30	4,950	23.18	4,760								
N	25.26	8,690	24.65	7,420	23.71	5,650	23.36	5,050	23.17	4,740	22.96	4,410								
4	25.16	8,480	24.64	7,400	23.64	5,530	23.40	5,120	23.17	4,730	23.02	4,500								
8	25.32	8,820	24.54	7,200	23.70	5,630	23.54	5,360	23.30	4,950	23.09	4,610								
12	25.32	8,820	24.37	6,860	23.70	5,630	23.53	5,340	23.30	4,950	23.06	4,570								
	June 16		June 17		June 18		June 19		June 20		June 21									
4	23.02	4,500	23.51	5,310	23.02	4,500	22.96	4,410	23.30	4,950	23.06	4,570								
8	23.02	4,500	23.47	5,240	22.92	4,350	22.87	4,280	23.12	4,660	23.05	4,550								
N	23.24	4,850	23.38	5,090	22.81	4,180	22.79	4,160	23.02	4,500	22.98	4,440								
4	23.45	5,200	23.25	4,870	22.80	4,170	22.99	4,460	22.97	4,420	22.91	4,340								
8	23.58	5,430	23.19	4,770	22.94	4,380	23.38	5,090	22.99	4,460	22.88	4,290								
12	23.55	5,380	23.12	4,660	23.01	4,490	23.41	5,140	23.02	4,500	22.81	4,180								

Supplemental record.- May 29, 2 a.m., 29.00 ft., 18,600 sec.-ft.

## Lake Chelan at Chelan, Wash.

Location.- Lat. 47°50'00", long. 120°03'40", in lot 3, sec. 15, T. 27 N., R. 22 E., 2 miles west of Chelan. Datum of gage is at mean sea level, adjustment of 1912.

Drainage area.- 950 square miles.

Gage-height record.- Water-stage recorder graph. Elevations given are mean 12 p.m. readings for stations at Chelan and at Purple Point at Stehekin.

Remarks.- Reservoir is formed by low concrete dam at lake outlet. Capacity, 676,100 acre-feet between elevations 1,079 and 1,100 feet. Regulation between these elevations is allowed by stipulation of Federal Power Commission. Water is used for power development. Gage-height record collected in cooperation with Washington Water Power Co.

Elevation\*, in feet, and contents, in acre-feet, at 12 p.m., 1948

Day	May		June		July	
	Feet	Acre-feet	Feet	Acre-feet	Feet	Acre-feet
1	88.10	288,970	97.28	586,910	99.18	649,220
2	88.16	290,900	97.39	590,510	99.19	649,550
3	88.23	293,160	97.56	596,090	99.29	652,830
4	88.25	293,800	97.70	600,680	99.48	659,060
5	88.29	295,090	97.92	607,900	99.70	666,280
6	88.34	296,700	98.19	616,750	99.83	670,540
7	88.38	297,990	98.54	628,230	99.88	672,180
8	88.46	300,560	98.74	634,790	99.84	670,870
9	88.60	305,070	98.80	636,760	99.83	670,540
10	88.70	308,290	98.90	640,040	99.88	672,180
11	88.78	310,870	98.91	640,370	99.82	670,220
12	88.95	316,340	98.74	634,790	99.82	670,220
13	89.09	320,850	98.50	626,920	99.84	670,870
14	89.22	325,030	98.36	622,330	99.85	671,200
15	89.34	328,900	98.32	621,020	99.88	672,180
16	89.51	334,370	98.49	626,590	99.89	672,510
17	89.66	339,200	98.65	631,840	99.85	671,200
18	89.82	344,350	98.68	632,820	99.84	670,870
19	90.01	350,470	98.70	633,480	99.84	670,870
20	90.26	357,280	98.74	634,790	99.80	669,560
21	90.58	368,940	98.72	634,140	99.82	670,220
22	91.04	383,850	98.64	631,510	99.88	672,180
23	91.63	402,960	98.64	631,510	99.85	671,200
24	92.18	420,780	98.71	633,810	99.79	669,230
25	92.75	439,250	98.74	634,790	99.84	670,870
26	93.48	463,000	98.78	636,100	99.80	669,560
27	94.43	493,970	98.83	637,740	99.80	669,560
28	95.98	544,500	98.92	640,700	99.79	669,230
29	97.02	578,400	99.00	643,320	99.78	668,900
30	97.20	584,290	99.12	647,260	99.86	671,530
31	97.24	585,600			99.90	672,840
Change in contents, acre-feet		+298,560		+61,660		+25,580
Change in contents, equivalent mean second-feet		+4,856		+1,036		+416

\* Add 1,000 feet to obtain elevation above mean sea level.

## Chelan River at Chelan, Wash.

Location.- Lat. 47°50'05", long. 120°00'40", in SE $\frac{1}{4}$  sec. 12, T. 27 N., R. 22 E., in forebay upstream from control dam at Chelan. Datum of gage is at mean sea level, subject to correction to datum of 1929.

Drainage area.- 950 square miles.

Gage-height record.- Water-stage recorder graph, supplemented by records of power-plant operation.

Discharge record.- Figures of daily discharge computed by adding discharge over spillway, discharge through turbines, and diversions past dam.

Maxima.- May-June 1948: Daily discharge, 16,000 second-feet (regulated) May 30.

1903 to April 1948: Discharge, 12,800 second-feet (regulated) June 3, 1936.

Remarks.- Diversions above station for irrigation are small percentage of total runoff. Washington Water Power Co. diverts water at Chelan for power and irrigation, which quantity is included in records of daily discharge. Flow regulated by Lake Chelan. Figures of discharge not adjusted for storage. Records collected in cooperation with Washington Water Power Co.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	708	12,600	4,090	11	1,190	15,100	4,200	21	798	8,420	2,850
2	332	11,100	3,740	12	678	15,100	2,790	22	1,000	8,410	2,070
3	1,330	10,300	2,090	13	745	14,700	2,660	23	293	6,410	3,320
4	1,320	10,500	1,040	14	761	12,300	2,810	24	1,420	5,260	2,960
5	1,320	10,600	697	15	527	9,500	2,680	25	1,790	5,270	2,400
6	1,300	10,900	1,940	16	180	8,100	3,370	26	1,870	5,310	2,200
7	1,300	11,200	2,770	17	726	8,270	4,560	27	1,790	5,330	2,240
8	918	13,300	3,780	18	760	8,340	4,750	28	2,650	5,310	2,130
9	193	14,800	3,270	19	760	8,350	3,770	29	13,400	4,800	1,930
10	1,240	15,000	2,320	20	753	8,440	4,340	30	16,000	3,950	1,420
								31	13,500		1,670
Monthly mean discharge, in second-feet .....									2,308	9,566	2,802
Runoff, in inches .....									2.80	11.23	3.40

## Railroad Creek at Lucerne, Wash.

Location.- Lat. 48°11'40", long. 120°35'50", in sec. 9, T. 31 N., R. 18 E., half a mile upstream from mouth and half a mile southwest of Lucerne.

Drainage area.- 64 square miles.

Gage-height record.- Water-stage recorder graph May 1 to May 24. Staff gage read once daily July 2-30 except July 18, 25, when there was no gage-height record. No gage-height record May 25 to July 1.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 1,280 second-feet and extended to peak stage on basis of combination slope-area and contracted opening measurement. Gage heights used to hundredths. Discharge for periods of no gage-height record computed on basis of records for nearby streams.

Maxima.- May-June 1948: Discharge, 3,900 second-feet May 28 (gage height, 8.1 feet, from floodmarks).

1910-13, 1927 to April 1948: Discharge, 1,910 second-feet June 8, 1927 (gage height, 5.3 feet).

Remarks.- No diversion or regulation. Gage-height record collected in cooperation with Washington Water Power Co. which furnished several discharge measurements.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July	
1	157	1,100	610	11	247	1,400	385	21	534	900	427	
2	152	1,100	544	12	258	1,200	418	22	731	800	427	
3	157	1,200	526	13	282	1,100	377	23	828	740	427	
4	175	1,300	517	14	276	1,000	401	24	970	700	409	
5	175	1,400	454	15	270	980	427	25	1,200	670	350	
6	191	1,600	544	16	276	1,000	445	26	1,500	680	299	
7	197	1,700	490	17	296	1,000	472	27	2,000	700	345	
8	207	1,700	401	18	320	900	490	28	3,000	730	291	
9	218	1,600	377	19	334	960	472	29	2,300	760	284	
10	241	1,600	361	20	394	960	454	30	1,500	710	314	
								31	1,300		329	
Monthly mean discharge, in second-feet .....										667	1,073	422
Runoff, in inches .....										12.02	18.71	7.59

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	3.40	288	3.44	314	3.47	334	3.50	353	3.72	504	3.98	697
8	3.40	288	3.44	314	3.47	334	3.52	366	3.71	497	4.00	712
N	3.40	288	3.44	314	3.47	334	3.53	373	3.71	497	4.01	720
4	3.42	301	3.45	320	3.47	334	3.58	407	3.76	533	4.03	735
8	3.43	308	3.47	334	3.47	334	3.64	448	3.85	599	4.09	782
12	3.44	314	3.47	334	3.48	340	3.70	490	3.93	659	4.14	822
	May 23		May 24		May 25		May 26		May 27		May 28	
4	4.16	838	9.33	974								
8	4.13	814	4.31	958								
N	4.10	790	4.30	850								
4	4.11	798	4.31	958								
8	4.19	862	4.37	1,010								
12	4.25	910	4.40	1,030								

## Wenatchee River Basin

Wenatchee Lake near Plain, Wash.

Location.- Lat. 47°49'50", long. 120°46'30", in sec. 19, T. 27 N., R. 17 E., on north shore,  $2\frac{1}{2}$  miles upstream from outlet,  $7\frac{1}{2}$  miles northwest of Plain, and 33 miles upstream from Leavenworth. Datum of gage is 1,800.00 feet above mean sea level, subject to correction to datum of 1929.

Drainage area.- 277 square miles.

Gage-height record.- Water-stage recorder graph except for period June 24-28.

Mean gage height, in feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	70.97	75.74	73.09	11	71.53	77.00	71.60	21	73.06	73.70	71.46
2	70.89	75.52	72.61	12	71.56	76.40	71.52	22	73.92	73.50	71.39
3	70.89	75.64	72.31	13	71.72	75.51	71.43	23	74.28	73.24	71.30
4	71.00	75.76	72.16	14	71.79	74.82	71.43	24	74.54		71.15
5	71.02	75.84	71.94	15	71.78	74.31	71.49	25	75.06		71.00
6	71.14	76.16	71.86	16	71.77	74.18	71.58	26	75.74		70.91
7	71.42	76.65	71.67	17	71.89	74.27	71.62	27	76.83		70.89
8	71.50	77.16	71.73	18	72.08	73.95	71.63	28	78.46	73.28	70.85
9	71.52	77.27	71.58	19	72.17	73.72	71.55	29	79.35	73.42	70.80
10	71.52	77.20	71.57	20	72.34	73.75	71.46	30	78.02	73.43	70.82
								31	76.49		70.86

Wenatchee River below Wenatchee Lake, Wash.

Location.- Lat. 47°49'50", long. 120°46'30", in sec. 19, T. 27 N., R. 17 E., on north shore of Wenatchee Lake, 2½ miles upstream from outlet, 7½ miles northwest of Flain, and 35 miles upstream from Leavenworth. Datum of gage is 1,800.00 feet above mean sea level, subject to correction to datum of 1929. Discharge measurements made half a mile downstream from lake outlet.

Drainage area.- 277 square miles.

Gage-height record.- Water-stage recorder graph except for period June 24-28 when there was no gage-height record.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 11,000 second-feet and extended to peak stage. Gage heights used to hundredths.

Discharge for period of no gage-height record computed on basis of records for stations on nearby streams.

Maxima.- May-June 1948: Discharge, 13,700 second-feet 6 a.m. May 29 (elevation of lake surface, 1,879.65 feet).

1932-42, 1946 to April 1948: Discharge, 8,310 second-feet June 16, 1933 (elevation of lake surface, 1,876.57 feet).

Remarks.- No diversion.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,210	6,950	3,580	11	1,790	8,720	1,870	21	3,540	4,510	1,720
2	1,130	6,660	3,000	12	1,830	7,880	1,780	22	4,590	4,070	1,640
3	1,130	6,820	2,650	13	2,000	6,660	1,680	23	5,060	3,760	1,540
4	1,240	7,000	2,490	14	2,080	5,760	1,680	24	5,390	3,700	1,390
5	1,260	7,080	2,240	15	2,070	5,100	1,750	25	6,080	3,640	1,240
6	1,380	7,530	2,160	16	2,060	4,910	1,850	26	6,970	3,570	1,150
7	1,670	8,220	2,170	17	2,190	5,030	1,890	27	8,480	3,600	1,130
8	1,760	8,960	2,010	18	2,390	4,620	1,900	28	11,300	3,810	1,090
9	1,780	9,120	1,850	19	2,500	4,340	1,820	29	13,000	3,970	1,040
10	1,780	9,050	1,840	20	2,690	4,370	1,720	30	10,500	3,990	1,060
								31	7,990		1,130
Monthly mean discharge, in second-feet .....									3,834	5,773	1,807
Runoff, in inches .....									15.96	23.25	7.52

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	71.83	2,120	72.02	2,330	72.14	2,460	72.22	2,550	72.80	3,230	73.65	4,250
8	71.87	2,170	72.07	2,390	72.16	2,490	72.25	2,580	72.96	3,420	73.94	4,480
N	71.90	2,200	72.09	2,410	72.18	2,510	72.30	2,640	73.10	3,590	73.99	4,680
4	71.92	2,220	72.10	2,420	72.18	2,510	72.39	2,740	73.20	3,710	74.08	4,790
8	71.95	2,260	72.10	2,420	72.18	2,510	72.47	2,830	73.28	3,810	74.15	4,880
12	71.97	2,280	72.12	2,440	72.22	2,550	72.62	3,010	73.44	4,000	74.20	4,950
May 23												
4	74.26	5,030	74.36	5,160	74.88	5,830	75.45	6,580	76.38	7,820	77.78	10,000
8	74.30	5,080	74.47	5,300	75.00	5,990	75.60	6,770	76.61	8,140	78.16	10,700
N	74.30	5,080	74.57	5,430	75.10	6,120	75.74	6,950	76.82	8,450	78.51	11,400
4	74.30	5,080	74.64	5,520	75.17	6,210	75.94	7,210	77.05	8,800	78.80	11,900
8	74.30	5,080	74.67	5,560	75.22	6,280	76.04	7,350	77.26	9,130	79.13	12,600
12	74.30	5,080	74.76	5,680	75.31	6,390	76.18	7,540	77.49	9,500	79.38	13,100
May 29												
4	79.57	13,500	78.62	11,600	76.91	8,580	75.88	7,130	75.54	6,690	75.54	6,690
8	79.57	13,500	78.32	11,000	76.68	8,240	75.82	7,080	75.54	6,690	75.60	6,770
N	79.43	13,200	78.04	10,500	76.48	7,960	75.75	6,960	75.53	6,680	75.66	6,850
4	79.26	12,900	77.71	9,880	76.28	7,680	75.67	6,860	75.50	6,640	75.70	6,900
8	79.09	12,500	77.42	9,380	76.08	7,400	75.58	6,740	75.46	6,590	75.72	6,930
12	78.86	12,000	77.15	8,950	75.94	7,210	75.54	6,690	75.47	6,600	75.75	6,960
June 4												
4	75.78	7,000	75.78	7,000	76.01	7,300	76.48	7,960	77.00	8,720	77.26	9,130
8	75.79	7,020	75.82	7,060	76.14	7,490	76.61	8,140	77.18	9,000	77.31	9,210
N	75.80	7,030	75.86	7,110	76.23	7,610	76.71	8,280	77.25	9,110	77.32	9,220
4	75.78	7,000	75.87	7,120	76.26	7,650	76.77	8,380	77.25	9,110	77.27	9,140
8	75.75	6,960	75.87	7,120	76.28	7,680	76.80	8,420	77.21	9,050	77.18	9,000
12	75.75	6,960	75.91	7,170	76.34	7,770	76.87	8,520	77.21	9,050	77.15	8,950
June 10												
4	77.18	9,000	77.10	8,870	76.70	8,270	75.78	7,000	75.05	6,060	74.44	5,260
8	77.23	9,080	77.08	8,840	76.68	8,240	75.65	6,840	74.95	5,920	74.39	5,200
N	77.26	9,130	77.02	8,750	76.44	7,910	75.51	6,650	74.83	5,770	74.32	5,110
4	77.24	9,090	76.96	8,660	76.27	7,670	75.38	6,480	74.71	5,610	74.25	5,020
8	77.21	9,050	76.86	8,510	76.08	7,400	75.25	6,320	74.60	5,470	74.17	4,910
12	77.14	8,930	76.78	8,390	75.91	7,170	75.15	6,180	74.50	5,340	74.14	4,870
June 16												
4	74.15	4,880	74.27	5,040	74.10	4,820	73.75	4,370	73.74	4,360	73.72	4,330
8	74.18	4,920	74.30	5,080	74.03	4,730	73.76	4,380	73.77	4,390	73.72	4,330
N	74.17	4,910	74.30	5,080	73.95	4,620	73.74	4,360	73.77	4,390	73.71	4,320
4	74.17	4,910	74.27	5,040	73.86	4,510	73.68	4,290	73.76	4,380	73.70	4,310
8	74.18	4,920	74.22	4,980	73.78	4,410	73.68	4,290	73.74	4,360	73.68	4,290
12	74.23	4,990	74.16	4,900	73.75	4,370	73.70	4,310	73.72	4,330	73.66	4,260

Supplemental record.- May 29, 6 a.m., 79.65 ft., 13,700 sec.-ft.

## Wenatchee River at Plain, Wash.

Location.- Lat. 47°45'50", long. 120°39'30", in lot 8, sec. 12, T. 26 N., R. 17 E., at Plain, a quarter of a mile downstream from Beaver Creek, 7½ miles downstream from Mason Creek, and 12 miles north of Leavenworth. Datum of gage is 1,805 feet above mean sea level.

Drainage area.- 591 square miles.

Gage-height record.- Water-stage recorder graph except for period 11:30 p.m. May 28 to 6 p.m. May 29, for which graph was drawn based on floodmark.

Discharge record.- Stage-discharge relation defined by current-meter measurements. Gage heights used to hundredths May 17 to June 21; half-tenths below and tenths above 5.5 feet May 1-16 and June 22 to July 31.

Maxima.- May-June 1948: Discharge, 22,700 second-feet about 8 a.m. May 29 (gage height, 12.43 feet, from floodmark).

1910-29, 1931 to April 1948: Discharge observed, 20,800 second-feet Dec. 13, 1921 (gage height, 11.8 feet, site and datum then in use).

Remarks.- Small diversion for irrigation from Chiwawa River is probably a small percent of the flood discharge.

Mean discharge, in second-feet, 1948

mean discharge, in second-feet, 1948											
Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2,030	12,200	6,000	11	3,140	15,000	3,140	21	6,480	7,720	2,740
2	1,920	11,800	5,070	12	3,210	13,400	3,000	22	8,200	7,200	2,610
3	2,030	12,000	4,550	13	3,500	11,300	2,800	23	8,900	6,790	2,490
4	2,200	12,300	4,210	14	3,580	9,860	2,800	24	9,500	6,590	2,200
5	2,200	12,500	3,810	15	3,500	8,830	2,870	25	10,500	6,590	1,980
6	2,490	13,300	3,730	16	3,580	8,700	3,000	26	12,000	6,190	1,860
7	3,000	14,400	3,730	17	3,800	9,080	3,070	27	14,400	6,190	1,920
8	3,000	15,500	3,430	18	4,100	8,290	3,070	28	18,600	6,590	1,810
9	3,070	15,600	3,070	19	4,250	7,820	2,940	29	21,900	6,790	1,710
10	3,070	15,500	3,070	20	4,900	7,930	2,800	30	18,000	6,790	1,760
								31	14,000		1,760
Monthly mean discharge, in second-feet									6,615	10,080	3,000
Runoff, in inches									12.90	19.04	5.85

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948												
Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	5.09	3,720	5.31	4,070	5.41	4,230	5.58	4,520	6.43	8,060	7.27	7,770
8	5.12	3,760	5.34	4,110	5.42	4,240	5.70	4,720	6.58	8,350	7.42	8,090
N	5.16	3,830	5.34	4,110	5.43	4,260	5.80	4,890	6.66	8,510	7.52	8,310
4	5.16	3,830	5.34	4,110	5.42	4,240	5.86	5,000	6.72	8,630	7.60	8,490
8	5.19	3,870	5.35	4,130	5.42	4,240	6.00	5,250	6.83	8,650	7.64	8,580
12	5.24	3,950	5.38	4,180	5.50	4,380	6.23	5,680	7.04	7,280	7.68	8,670
	May 23		May 24		May 25		May 26		May 27		May 28	
4	7.73	8,790	7.88	9,130	8.30	10,200	8.75	11,300	9.50	13,400	10.61	16,600
8	7.80	8,950	7.98	9,370	8.39	10,400	8.90	11,700	9.66	13,800	10.89	17,500
N	7.81	8,970	8.08	9,610	8.46	10,600	9.00	12,000	9.83	14,300	11.19	18,500
4	7.79	8,930	8.12	9,710	8.51	10,700	9.14	12,300	10.02	14,800	11.50	19,500
8	7.80	8,950	8.13	9,730	8.53	10,700	9.23	12,600	10.21	15,400	11.81	20,500
12	7.82	9,000	8.19	9,880	8.62	11,000	9.35	12,900	10.40	16,000	12.09	21,500
	May 29		May 30		May 31		June 1		June 2		June 3	
4	12.31	22,300	11.55	19,700	10.06	15,000	9.21	12,500	8.94	11,800	8.93	11,800
8	12.43	22,700	11.31	18,900	9.87	14,400	9.17	12,400	8.96	11,900	8.99	11,900
N	12.40	22,600	11.06	18,100	9.70	13,900	9.12	12,300	8.96	11,900	9.06	12,100
4	12.17	21,800	10.77	17,100	9.54	13,500	9.06	12,100	8.92	11,800	9.10	12,200
8	11.98	21,100	10.50	16,300	9.39	13,000	8.98	11,900	8.88	11,600	9.10	12,200
12	11.79	20,500	10.30	15,700	9.26	12,700	8.93	11,800	8.88	11,600	9.10	12,200
	June 4		June 5		June 6		June 7		June 8		June 9	
4	9.11	12,300	9.11	12,300	9.34	12,900	9.66	13,800	10.11	15,100	10.27	15,600
8	9.13	12,300	9.19	12,500	9.42	13,100	9.78	14,200	10.23	15,500	10.31	15,700
N	9.15	12,400	9.22	12,600	9.51	13,400	9.90	14,500	10.33	15,800	10.33	15,800
4	9.15	12,400	9.26	12,700	9.56	13,500	9.99	14,800	10.33	15,800	10.30	15,700
8	9.12	12,300	9.26	12,700	9.57	13,500	10.02	14,800	10.29	15,700	10.26	15,600
12	9.10	12,200	9.28	12,700	9.59	13,600	10.05	14,900	10.27	15,600	10.19	15,400
	June 10		June 11		June 12		June 13		June 14		June 15	
4	10.19	15,400	10.12	15,200	9.79	14,200	8.95	11,800	8.35	10,300	7.85	9,060
8	10.20	15,400	10.10	15,100	9.67	13,800	8.85	11,600	8.28	10,100	7.82	9,000
N	10.29	15,700	10.12	15,700	9.55	13,500	8.76	11,300	8.20	9,900	7.77	8,880
4	10.30	15,700	10.06	15,000	9.38	13,000	8.66	11,100	8.10	9,660	7.70	8,720
8	10.22	15,400	9.96	14,700	9.22	12,600	8.54	10,800	8.00	9,420	7.61	8,510
12	10.17	15,300	9.87	14,400	9.07	12,200	8.42	10,400	7.90	9,180	7.60	8,440
	June 16		June 17		June 18		June 19		June 20		June 21	
4	7.61	8,510	7.89	9,160	7.68	8,670	7.32	7,870	7.34	7,920	7.29	7,810
8	7.65	8,600	7.91	9,200	7.61	8,510	7.33	7,900	7.39	8,030	7.28	7,790
N	7.69	8,700	7.90	9,180	7.52	8,310	7.32	7,870	7.39	8,030	7.27	7,770
4	7.71	8,740	7.86	9,090	7.41	8,070	7.27	7,770	7.36	7,950	7.24	7,700
8	7.78	8,900	7.81	8,970	7.32	7,870	7.23	7,680	7.31	7,650	7.20	7,620
12	7.83	9,020	7.73	8,790	7.31	7,850	7.27	7,770	7.29	7,810	7.14	7,490

## Wenatchee River at Peshastin, Wash.

Location.- Lat. 47°34'50", long. 120°37'00", in SE $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 8, T. 24 N., R. 18 E.,

1 mile northwest of Peshastin and 3 $\frac{1}{2}$  miles upstream from Peshastin Creek. Datum of gage is 1,028.04 feet above mean sea level, datum of 1929.

Drainage area.- 1,000 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 25,000 second-feet and extended to peak stage.

Gage heights used to hundredths May 17 to June 21; half-tenths below and tenths above 5.2 feet May 1-16 and June 22 to July 31.

Maxima.- May-June 1948: Discharge, 32,200 second-feet 8 p.m. May 28, 1948 (gage height, 15.87 feet).

1929 to April 1948: Discharge, 20,400 second-feet June 16, 1933 (gage height, 11.82 feet).

The flood of May 28, 1948 is the greatest known since 1905.

Remarks.- Several diversions above station for irrigation. Some regulation by power plant in Tumwater Canyon.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2,720	17,400	8,620	11	4,190	22,700	4,510	21	9,240	11,400	3,820
2	2,600	17,200	7,190	12	4,350	20,100	4,350	22	11,500	10,400	3,600
3	2,720	17,800	6,430	13	4,670	16,600	4,040	23	12,200	9,700	3,390
4	2,980	18,000	5,880	14	4,840	14,400	4,040	24	13,800	9,480	3,050
5	2,980	18,400	5,350	15	4,670	12,700	4,040	25	15,600	9,260	2,790
6	3,320	19,600	5,520	16	4,840	12,900	4,190	26	17,800	9,040	2,600
7	4,040	21,400	5,350	17	5,220	13,600	4,190	27	22,100	8,830	2,540
8	4,040	22,800	4,840	18	5,590	12,100	4,350	28	29,200	9,260	2,540
9	4,040	22,700	4,510	19	5,820	11,400	4,190	29	30,900	9,700	2,360
10	4,190	22,400	4,350	20	7,150	11,600	3,890	30	25,400	9,700	2,360
								31	19,700		2,360
Monthly mean discharge, in second-feet .....									9,430	14,750	4,230
Runoff, in inches .....									10.87	16.46	4.88

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	5.94	5,080	6.19	5,500	6.31	5,720	6.74	6,510	7.81	8,640	8.83	10,900
8	6.00	5,180	6.25	5,610	6.34	5,770	6.96	6,920	7.97	8,980	9.03	11,400
N	6.04	5,250	6.25	5,610	6.37	5,830	7.09	7,170	8.06	9,170	9.14	11,600
4	6.07	5,300	6.25	5,610	6.38	5,840	7.23	7,450	8.18	9,440	9.21	11,800
8	6.08	5,320	6.27	5,650	6.38	5,840	7.36	7,710	8.40	9,920	9.32	12,100
12	6.13	5,400	6.30	5,700	6.52	6,100	7.61	8,220	8.62	10,400	9.39	12,200
	May 23		May 24		May 25		May 26		May 27		May 28	
4	9.40	12,200	9.85	13,400	10.58	15,300	11.31	17,300	12.44	20,600	14.34	26,700
8	9.38	12,200	9.96	13,600	10.63	15,400	11.37	17,400	12.70	21,400	14.53	27,300
N	9.38	12,200	10.02	13,800	10.63	15,400	11.43	17,600	12.90	22,000	14.91	28,700
4	9.34	12,100	10.08	13,900	10.66	15,500	11.50	17,800	13.10	22,600	15.70	31,500
8	9.40	12,000	10.28	14,500	10.90	16,100	11.81	18,700	13.44	23,700	15.87	32,200
12	9.62	12,800	10.48	15,000	11.14	16,800	12.13	19,600	13.97	25,400	15.84	32,000
	May 29		May 30		May 31		June 1		June 2		June 3	
4	15.75	31,700	14.66	27,800	12.65	21,200	11.55	17,900	11.30	17,200	11.48	17,700
8	15.68	31,500	14.32	26,600	12.32	20,200	11.41	17,500	11.26	17,100	11.48	17,700
N	15.62	31,200	13.95	25,400	12.05	19,400	11.31	17,300	11.20	17,000	11.48	17,700
4	15.46	30,600	13.56	24,100	11.83	18,700	11.22	17,000	11.18	16,900	11.50	17,800
8	15.25	29,900	13.23	23,000	11.72	18,400	11.25	17,100	11.32	17,300	11.56	18,000
12	14.97	28,900	12.94	22,100	11.67	18,300	11.33	17,300	11.45	17,600	11.62	18,100
	June 4		June 5		June 6		June 7		June 8		June 9	
4	11.61	18,100	11.72	18,400	12.03	19,300	12.62	21,100	13.17	22,800	13.30	23,200
8	11.53	17,900	11.64	18,200	12.02	19,300	12.60	21,000	13.13	22,700	13.18	22,900
N	11.47	17,700	11.57	18,000	11.99	19,200	12.60	21,000	13.07	22,500	13.03	22,400
4	11.46	17,700	11.60	18,100	12.09	19,500	12.69	21,300	13.11	22,600	12.98	22,200
8	11.62	18,100	11.80	18,700	12.37	20,400	12.94	22,100	13.30	23,200	13.06	22,500
12	11.72	18,400	12.00	19,200	12.57	21,900	13.12	22,700	13.38	23,500	13.16	22,800
	June 10		June 11		June 12		June 13		June 14		June 15	
4	13.11	22,600	12.94	22,100	12.81	21,700	11.36	17,400	10.53	15,100	9.79	13,200
8	12.98	22,200	12.91	22,000	12.52	20,800	11.19	16,900	10.47	15,000	9.67	12,900
N	12.86	21,900	13.13	22,700	12.24	20,000	11.05	16,500	10.22	14,300	9.56	12,600
4	12.97	22,200	13.35	23,400	11.97	19,200	10.91	16,100	10.06	13,900	9.47	12,400
8	13.10	22,600	13.30	23,200	11.76	18,500	10.80	15,800	9.95	13,600	9.40	12,200
12	13.10	22,600	13.10	22,600	11.55	17,900	10.69	15,600	9.86	13,400	9.44	12,300
	June 16		June 17		June 18		June 19		June 20		June 21	
4	9.46	16,400	10.13	14,100	9.56	12,600	9.10	11,500	9.14	11,600	9.06	11,400
8	9.47	12,400	10.08	13,900	9.42	12,300	9.04	11,400	9.16	11,700	9.08	11,500
N	9.58	12,700	9.99	13,700	9.30	12,000	9.00	11,300	9.16	11,700	9.03	11,400
4	9.78	13,200	9.88	13,400	9.17	11,700	8.98	11,200	9.12	11,600	9.02	11,300
8	9.97	13,700	9.79	13,200	9.12	11,600	9.10	11,500	9.08	11,500	8.97	11,200
12	10.10	14,000	9.68	12,900	9.11	11,600	9.15	11,600	9.07	11,500	8.90	11,100

Supplemental record.- May 28, 6 p.m., 15.83 ft., 32,000 sec.-ft.



## Chiwawa River near Plain, Wash.

Location.- Lat. 47°50'30", long. 120°39'40", in SE<sup>1</sup> sec. 13, T. 27 N., R. 17 E., half a mile upstream from Goose Creek, 6 miles north of Plain, 7 miles upstream from mouth, and 11 miles northeast of Chiwaukum. Datum of gage is 2,100 feet above mean sea level (from river-profile map).

Drainage area.- 169 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 5,880 second-feet 3 a.m. May 29 (gage height, 9.17 feet).

1911-14, 1936 to April 1948: Discharge, 3,210 second-feet May 25, 26, 1938 (gage height, 7.66 feet).

Remarks.- No diversions or regulation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	453	3,250	1,460	11	843	3,910	808	21	1,790	2,100	741
2	458	3,210	1,210	12	864	3,400	767	22	2,310	1,860	696
3	514	3,260	1,090	13	962	2,850	722	23	2,570	1,770	656
4	536	3,300	1,050	14	927	2,470	728	24	2,710	1,710	560
5	536	3,430	962	15	913	2,240	748	25	2,840	1,700	508
6	656	3,640	983	16	913	2,300	774	26	3,380	1,650	486
7	734	4,000	913	17	956	2,490	774	27	4,170	1,620	508
8	734	4,250	836	18	1,030	2,240	760	28	4,980	1,710	464
9	767	4,080	767	19	1,100	2,120	741	29	5,580	1,760	453
10	829	4,080	780	20	1,350	2,260	715	30	4,530	1,710	475
								31	3,520		475
Monthly mean discharge, in second-feet .....									1,756	2,679	762
Runoff, in inches .....									11.98	17.69	5.20

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	5.54	948	5.66	1,040	5.75	1,110	5.87	1,210	6.39	1,690	6.86	2,200
8	5.54	948	5.65	1,030	5.74	1,100	5.94	1,270	6.44	1,740	6.93	2,290
N	5.54	948	5.63	1,010	5.73	1,090	5.99	1,310	6.45	1,750	6.95	2,310
4	5.54	948	5.64	1,020	5.71	1,080	6.03	1,350	6.48	1,780	6.97	2,330
8	5.57	969	5.68	1,050	5.71	1,080	6.17	1,470	6.62	1,930	7.03	2,410
12	5.63	1,010	5.73	1,090	5.79	1,140	6.28	1,580	6.78	2,110	7.11	2,500
	May 23		May 24		May 25		May 26		May 27		May 28	
4	7.17	2,580	7.22	2,650	7.32	2,780	7.55	3,090	8.07	3,870	8.53	4,650
8	7.18	2,590	7.27	2,710	7.33	2,790	7.68	3,270	8.17	4,030	8.58	4,740
N	7.17	2,580	7.29	2,740	7.38	2,850	7.77	3,400	8.26	4,180	8.60	4,780
4	7.14	2,540	7.29	2,740	7.38	2,850	7.77	3,560	8.38	4,390	8.83	5,210
8	7.17	2,580	7.28	2,720	7.41	2,890	7.90	3,600	8.40	4,420	9.00	5,540
12	7.19	2,610	7.29	2,740	7.47	2,980	7.97	3,710	8.47	4,550	9.10	5,740
	May 29		May 30		May 31		June 1		June 2		June 3	
4	9.14	5,820	8.80	5,150	7.96	3,700	7.68	3,270	7.64	3,220	7.64	3,220
8	9.12	5,780	8.55	4,690	7.89	3,580	7.67	3,260	7.66	3,240	7.67	3,260
N	9.06	5,660	8.24	4,150	7.83	3,500	7.67	3,260	7.66	3,240	7.68	3,270
4	8.93	5,400	8.34	4,320	7.77	3,400	7.65	3,230	7.63	3,200	7.69	3,290
8	8.87	5,280	8.21	4,100	7.73	3,340	7.64	3,220	7.62	3,190	7.69	3,290
12	8.88	5,300	8.06	3,860	7.69	3,290	7.63	3,200	7.61	3,170	7.68	3,270
	June 4		June 5		June 6		June 7		June 8		June 9	
4	7.69	3,290	7.74	3,360	7.81	3,460	8.02	3,790	8.27	4,200	8.18	4,050
8	7.70	3,300	7.78	3,420	7.87	3,560	8.15	4,000	8.38	4,390	8.23	4,130
N	7.70	3,300	7.81	3,460	7.95	3,680	8.21	4,100	8.39	4,400	8.24	4,150
4	7.70	3,300	7.83	3,500	8.01	3,780	8.22	4,110	8.34	4,320	8.21	4,100
8	7.70	3,300	7.83	3,500	8.01	3,780	8.21	4,100	8.23	4,130	8.18	4,050
12	7.71	3,310	7.75	3,380	7.98	3,730	8.21	4,100	8.18	4,050	8.13	3,970
	June 10		June 11		June 12		June 13		June 14		June 15	
4	8.12	3,950	8.08	3,890	7.89	3,580	7.46	2,960	7.19	2,610	6.93	2,290
8	8.19	4,060	8.11	3,940	7.83	3,500	7.42	2,910	7.15	2,560	6.92	2,270
N	8.29	4,230	8.15	4,000	7.78	3,420	7.38	2,850	7.09	2,480	6.90	2,250
4	8.26	4,180	8.12	3,950	7.73	3,340	7.33	2,790	7.02	2,390	6.87	2,210
8	8.20	4,080	8.05	3,840	7.63	3,200	7.28	2,720	6.97	2,330	6.84	2,180
12	8.11	3,940	7.97	3,710	7.51	3,030	7.23	2,660	6.95	2,290	6.83	2,170
	June 16		June 17		June 18		June 19		June 20		June 21	
4	6.84	2,180	7.12	2,520	6.99	2,360	6.81	2,140	6.90	2,250	6.81	2,140
8	6.90	2,250	7.13	2,530	6.94	2,500	6.81	2,140	6.97	2,330	6.80	2,130
N	6.92	2,270	7.12	2,520	6.89	2,240	6.80	2,150	6.97	2,330	6.78	2,110
4	7.00	2,370	7.10	2,490	6.83	2,170	6.77	2,100	6.93	2,290	6.76	2,090
8	7.02	2,390	7.08	2,470	6.80	2,130	6.77	2,100	6.87	2,210	6.72	2,040
12	7.08	2,470	7.00	2,370	6.79	2,120	6.82	2,150	6.83	2,170	6.68	2,000

Supplemental record.- May 28, 5 a.m., 8.35 ft., 4,340 sec.-ft.; May 29, 3 a.m., 9.17 ft., 5,880 sec.-ft.; May 30, 1 p.m., 8.50 ft., 4,600 sec.-ft.

Icicle Creek above Snow Creek, near Leavenworth, Wash.

Location.- Lat. 47°32'25", long. 12C°42'55", in SE $\frac{1}{4}$  sec. 28, T. 24 N., R. 17 E., three-eighths of a mile upstream from Snow Creek and  $\frac{1}{2}$  miles southwest of Leavenworth.

Drainage area.- 193 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 6,910 second-feet and extended to peak stage on basis of slope-area measurement.

Maxima.- May-June 1948: Discharge, 17,500 second-feet 3 p.m. May 28 (gage height, 13.93 feet), by slope-area method.

1936 to April 1948: Discharge, 4,320 second-feet June 3, 1937 (gage height, 10.10 feet).

Remarks.- No diversion. Some regulation in headwater lakes for irrigation.

*Mean discharge, in second-feet, 1948*

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	475	3,590	1,820	11	699	5,170	1,030	21	2,420	2,830	795
2	448	3,850	1,510	12	736	4,040	960	22	2,770	2,530	755
3	504	4,260	1,400	13	834	3,460	895	23	2,600	2,270	715
4	518	4,080	1,320	14	794	3,110	895	24	3,630	2,270	628
5	518	4,240	1,150	15	794	2,850	895	25	4,350	2,190	577
6	658	4,870	1,250	16	875	3,260	915	26	5,260	2,110	546
7	794	5,460	1,220	17	1,020	3,260	915	27	7,590	2,110	562
8	756	5,650	1,050	18	1,060	2,710	1,000	28	13,600	2,350	546
9	717	5,170	1,000	19	1,090	2,780	895	29	6,770	2,440	517
10	717	4,820	1,000	20	1,820	2,810	835	30	4,050	2,350	517
								31	3,500		532
Monthly mean discharge, in second-feet .....									2,334	3,429	924
Runoff, in inches .....									13.94	19.82	5.52

*Gage height, in feet, and discharge, in second-feet, at indicated time, 1948*

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	6.01	1,010	6.18	1,090	6.13	1,060	7.13	1,560	8.26	2,360	8.78	2,870
8	6.03	1,020	6.13	1,050	6.09	1,050	7.47	1,740	8.21	2,320	8.73	2,820
N	6.02	1,010	6.08	1,040	6.10	1,050	7.47	1,760	8.13	2,250	8.64	2,730
4	6.01	1,010	6.05	1,030	6.13	1,060	7.60	1,850	8.24	2,350	8.61	2,700
8	6.08	1,040	6.11	1,050	6.30	1,140	8.03	2,160	8.53	2,620	8.66	2,750
12	6.17	1,080	6.14	1,070	6.67	1,320	8.25	2,360	8.73	2,820	8.63	2,720
	May 23		May 24		May 25		May 26		May 27		May 28	
4	8.53	2,620	9.33	3,450	10.05	4,300	10.70	5,160	11.75	6,890	13.18	11,900
8	8.46	2,550	9.34	3,460	9.91	4,130	10.57	4,980	11.83	7,110	13.50	14,000
N	8.36	2,450	9.26	3,380	9.73	3,920	10.43	4,790	11.75	6,940	13.75	15,900
4	8.35	2,440	9.49	3,630	9.94	4,170	10.73	5,200	12.02	7,550	13.85	16,800
8	8.52	2,610	9.92	4,140	10.48	4,850	11.09	5,740	12.45	8,820	13.30	12,600
12	9.03	3,120	10.04	4,290	10.70	5,160	11.40	6,260	12.83	10,200	12.75	9,910
	May 29		May 30		May 31		June 1		June 2		June 3	
4	12.30	8,320	10.20	4,520	9.31	3,590	9.40	3,680	9.62	3,900	10.12	4,430
8	11.87	7,190	9.88	4,170	9.19	3,470	9.30	3,580	9.56	3,840	10.08	4,390
N	11.53	6,500	9.60	3,880	9.07	3,350	9.17	3,450	9.41	3,690	9.94	4,230
4	11.17	5,870	9.43	3,710	9.05	3,330	9.11	3,390	9.33	3,610	9.85	4,140
8	10.83	5,340	9.45	3,730	9.26	3,540	9.37	3,650	9.67	3,950	9.86	4,150
12	10.51	4,900	9.42	3,700	9.40	3,680	9.59	3,870	10.01	4,310	9.86	4,150
	June 4		June 5		June 6		June 7		June 8		June 9	
4	9.80	4,080	10.00	4,300	10.44	4,810	11.00	5,600	11.15	5,840	10.90	5,450
8	9.70	3,980	9.80	4,080	10.20	4,520	10.80	5,300	10.80	5,300	10.55	4,960
N	9.57	3,850	9.64	3,920	10.07	4,380	10.57	4,990	10.65	5,090	10.33	4,680
4	9.60	3,880	9.71	3,990	10.40	4,760	10.67	5,120	11.00	5,600	10.50	4,890
8	10.00	4,300	10.20	4,520	10.90	5,450	11.10	5,760	11.22	5,950	10.81	5,320
12	10.11	4,420	10.50	4,890	11.08	5,730	11.40	6,260	11.22	5,950	10.90	5,450
	June 10		June 11		June 12		June 13		June 14		June 15	
4	10.70	5,160	10.30	4,640	10.25	4,580	9.26	3,540	9.00	3,280	8.62	2,910
8	10.40	4,760	10.38	4,740	9.89	4,180	9.20	3,480	8.98	3,260	8.52	2,820
N	10.18	4,500	10.90	5,450	9.52	3,800	9.17	3,450	8.72	3,000	8.42	2,730
4	10.22	4,540	11.10	5,760	9.41	3,690	9.12	3,400	8.68	2,960	8.47	2,770
8	10.45	4,820	10.93	5,500	9.40	3,680	9.10	3,380	8.71	2,990	8.61	2,900
12	10.50	4,890	10.60	5,020	9.34	3,620	9.06	3,340	8.70	2,980	8.66	2,940
	June 16		June 17		June 18		June 19		June 20		June 21	
4	8.61	2,900	9.30	3,580	8.51	2,810	8.46	2,760	8.64	2,930	8.56	2,850
8	8.65	2,940	9.11	3,390	8.37	2,680	8.35	2,660	8.54	2,840	8.58	2,870
N	8.95	3,250	8.96	3,240	8.24	2,570	8.28	2,600	8.46	2,760	8.58	2,870
4	9.23	3,510	8.80	3,080	8.24	2,570	8.45	2,760	8.40	2,710	8.53	2,830
8	9.41	3,690	8.70	2,980	8.41	2,720	8.69	2,970	8.44	2,750	8.48	2,780
12	9.41	3,690	8.61	2,900	8.51	2,810	8.71	2,990	8.50	2,800	8.40	2,710

Supplemental record.- May 28, 3 p.m., 13.93 ft., 17,500 sec.-ft.

Crab Creek Basin

Crab Creek at Irby, Wash.

Location.- Lat. 47°21'30", long. 118°51'00", in NW¼ sec. 31, T. 22 N., R. 32 E., 8 feet upstream from county road bridge at Irby, 5 miles downstream from Lake Creek, and 7 miles west of Odessa.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements. Gage heights used to hundredths May 1 to June 21; half-tenths above 3.2 feet and hundredths below June 22 to July 31.

Maxima.- May-June 1948: Discharge, 1,190 second-feet 5 a.m. June 12, 1948 (gage height, 6.98 feet).

1942 to April 1948: Discharge, 965 second-feet Feb. 25, 1946 (gage height, 6.65 feet).

Remarks.- No regulation. Some diversion above station for irrigation.

*Mean discharge, in second-feet, 1948*

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	35	591	194	11	45	574	113	21	101	333	76
2	35	561	184	12	50	1,060	116	22	112	308	71
3	38	519	177	13	55	732	120	23	133	292	64
4	44	545	169	14	56	620	116	24	188	278	64
5	46	510	164	15	58	541	107	25	377	263	68
6	49	456	158	16	66	562	94	26	601	250	63
7	48	415	154	17	72	517	90	27	545	237	66
8	41	379	153	18	77	499	84	28	448	220	78
9	39	352	132	19	86	436	82	29	428	210	78
10	42	364	120	20	96	373	80	30	434	205	76
								31	522		76
Monthly mean discharge, in second-feet .....									160	440	109
Runoff, in inches .....									-	-	-

*Gage height, in feet, and discharge, in second-feet, at indicated time, 1948*

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	2.56	71	2.58	75	2.62	82	2.70	98	2.70	98	2.74	107
8	2.56	71	2.59	76	2.63	84	2.69	96	2.71	100	2.75	109
N	2.57	73	2.60	78	2.64	86	2.69	96	2.71	100	2.76	111
4	2.57	73	2.60	78	2.65	88	2.69	96	2.72	102	2.76	111
8	2.57	73	2.60	78	2.67	92	2.69	96	2.73	105	2.79	118
12	2.58	75	2.60	78	2.68	94	2.69	96	2.74	107	2.81	122
	May 23		May 24		May 25		May 26		May 27		May 28	
4	2.84	128	3.01	160	3.77	252	5.47	591	5.43	579	4.99	468
8	2.84	128	3.10	174	4.02	288	5.50	600	5.35	558	4.92	454
N	2.85	130	3.20	188	4.41	353	5.52	606	5.30	545	4.87	444
4	2.88	136	3.33	203	4.88	446	5.54	612	5.24	530	4.83	436
8	2.90	140	3.45	215	5.21	522	5.54	612	5.17	512	4.78	426
12	2.93	145	3.59	230	5.39	568	5.50	600	5.09	492	4.78	426
	May 29		May 30		May 31		June 1		June 2		June 3	
4	4.82	434	4.75	420	5.04	480	5.47	591	5.42	576	5.24	530
8	4.82	434	4.77	424	5.13	502	5.49	597	5.39	568	5.21	522
N	4.80	430	4.81	432	5.22	525	5.49	597	5.37	562	5.18	515
4	4.77	424	4.84	438	5.31	548	5.48	594	5.33	552	5.15	508
8	4.75	420	4.89	448	5.36	560	5.47	591	5.31	548	5.16	510
12	4.77	424	4.95	460	5.41	573	5.44	582	5.27	538	5.22	525
	June 4		June 5		June 6		June 7		June 8		June 9	
4	5.22	525	5.25	532	5.00	470	4.79	428	4.60	390	4.43	357
8	5.30	545	5.20	520	4.97	464	4.75	420	4.58	386	4.43	357
N	5.34	555	5.16	510	4.93	456	4.73	416	4.55	380	4.41	353
4	5.35	558	5.12	500	4.89	448	4.69	408	4.52	374	4.38	347
8	5.34	555	5.08	490	4.86	442	4.66	402	4.48	366	4.39	349
12	5.29	542	5.04	480	4.83	436	4.63	396	4.45	360	4.36	344
	June 10		June 11		June 12		June 13		June 14		June 15	
4	4.35	342	4.58	386	6.96	1,180	6.12	813	5.68	654	5.36	560
8	4.37	346	4.60	390	6.90	1,150	5.97	754	5.63	639	5.38	565
N	4.49	368	4.72	414	6.74	1,080	5.85	712	5.58	624	5.30	545
4	4.54	378	5.52	606	6.57	1,000	5.77	684	5.52	606	5.20	520
8	4.57	384	6.33	897	6.41	930	5.72	667	5.45	585	5.16	510
12	4.58	386	6.81	1,110	6.25	865	5.69	657	5.41	573	5.20	520
	June 16		June 17		June 18		June 19		June 20		June 21	
4	5.31	548	5.21	522	5.19	518	4.95	460	4.59	388	4.38	347
8	5.50	600	5.19	518	5.17	512	4.90	450	4.55	380	4.34	340
N	5.47	591	5.15	508	5.12	500	4.84	438	4.50	370	4.29	331
4	5.35	558	5.16	510	5.08	490	4.78	426	4.47	364	4.24	323
8	5.29	542	5.19	518	5.04	480	4.68	406	4.44	359	4.23	321
12	5.24	530	5.20	520	4.99	468	4.64	398	4.40	351	4.23	321

Supplemental record.- June 10, 2 a.m., 4.38 ft., 347 sec.-ft., 6 a.m., 4.33 ft., 338 sec.-ft.; June 12, 5 a.m., 6.97 ft., 1,180 sec.-ft.; June 16, 10 a.m., 5.55 ft., 615 sec.-ft.

Location. - Lat. 47°11'25", long. 119°16'00", in SW 1/4 sec. 26, T. 20 N., R. 28 E., 3 miles upstream from Parker Horn and 4 miles north of Moses Lake.

Gage-height record. - Water-stage recorder graph.

Discharge record. - Stage-discharge relation defined by current-meter measurements.

Gage heights used to hundredths. Shifting-control method used June 5-15, June 28 to July 31.

Maxima. - May-June 1948: Discharge, 618 second-feet 2:30 p.m. June 16 (gage height, 3.75 feet).

1942 to April 1948: Discharge, 456 second-feet Mar. 2, 1946 (gage height, 3.47 feet).

Remarks. - Some diversion in upper Crab Creek Basin for irrigation. Most of flow from upper basin passes this station under ground. No regulation.

[illegible]

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	June 4		June 5		June 6		June 7		June 8		June 9	
4				0	2.47	129					2.76	197
8				0	2.51	138					2.77	200
N				0	2.54	145	2.67	174	2.74	192	2.78	202
4			2.27	88	2.57	151					2.77	200
8			2.36	106	2.60	158					2.76	197
12			2.42	119	2.63	165	2.70	182	2.75	194	2.76	197
	June 10		June 11		June 12		June 13		June 14		June 15	
4			2.92	243			2.86	231				
8			2.92	243			2.89	240				
N	2.81	210	2.90	237	2.85	226	2.94	254	3.25	354	3.53	481
4	2.81	210					2.97	263			3.57	503
8	2.90	234					3.02	277			3.58	509
12	2.91	237	2.87	229	2.85	226	3.06	289	3.37	401	3.59	514
	June 16		June 17		June 18		June 19		June 20		June 21	
4	3.59	520										
8	3.65	555										
N	3.68	573	3.64	549	3.58	514	3.53	486	3.51	476	3.48	460
4	3.74	611										
8	3.70	585										
12	3.67	567	3.62	537	3.55	498	3.52	481	3.51	476	3.45	448

Crab Creek near Warden, Wash.

Location. - Lat. 46°58'20", long. 119°15'40" in SE<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> sec. 11, T. 17 N.; R. 28 E., three-quarters of a mile downstream from Lind Coulee and 10 miles west of Warden.

Gage-height record. - Water-stage recorder graph.

Discharge record. - stage-discharge relation defined by current-meter measurements below 25 second-feet and extended to peak stage. Gage heights used to hundredths.

Shifting-control method used May 5-30, June 7-11, June 14 to July 31.

Maxima. - May-June 1948: Discharge, 28 second-feet 6 p.m. May 28 (gage height, 8.45 feet).

1909-12, 1942 to April 1948: Discharge, 3,000 second-feet Feb. 7, 1943 (gage height, 4.25 feet, datum then in use).

Remarks. - Many small diversions for irrigation. Some regulation by Moses Lake. Flow regulated by construction of Potholes Dam.

[illegible]

## Crab Creek near Smyrna, Wash.

Location.- Lat. 46°50'35", long. 119°36'25", in SE $\frac{1}{4}$  sec. 30, T. 16 N., R. 26 E., at county road bridge, 2 $\frac{1}{2}$  miles east of Smyrna.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge, 19.8 second-feet 3 a.m. to noon May 28 (gage height, 1.97 feet).

1942 to April 1948: Discharge, 3,300 second-feet Feb. 8, 1943 (gage height, 7.5 feet, estimated by observer).

Remarks.- Many diversions above station for irrigation. Some regulation by Moses Lake.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	8.1	14	0.5	11	12	11	0.8	21	12	6.8	1.1
2	6.7	12	.4	12	11	8.8	.7	22	10	6.9	.9
3	7.4	9.8	.4	13	12	8.8	.6	23	11	5.6	.6
4	7.8	9.6	.3	14	10	9.9	.5	24	13	4.3	.6
5	8.1	9.7	.5	15	9.6	9.3	.4	25	13	3.2	.5
6	9.1	9.1	.8	16	10	9.4	.4	26	12	2.2	.4
7	8.8	8.2	.6	17	11	9.6	.4	27	19	1.7	.4
8	7.6	7.3	.6	18	9.5	9.6	.4	28	20	1.3	.3
9	9.4	6.4	.6	19	12	8.4	.6	29	18	1.0	.3
10	12	5.6	.6	20	14	7.4	1.0	30	17	.6	.3
								31	16		.4
Monthly mean discharge, in second-feet.....									11.5	7.25	.55
Runoff, in inches.....									-	-	-

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Gage height, in feet, and discharge, in second-feet, at Madison Falls, 1940																				
Hour	Gage height		Discharge		Gage height		Discharge		Gage height		Discharge		Gage height		Discharge		Gage height		Discharge	
	May 17		May 18		May 19		May 20		May 21		May 22		May 23		May 24		May 25		May 26	
4	1.73	11	1.68	9.6	1.67	9.4	1.83	14	1.80	13	1.70	10	1.72	11	1.78	13	1.78	13	1.76	12
8	1.73	11	1.68	9.6	1.69	9.9	1.83	14	1.79	13	1.69	9.9	1.73	11	1.78	13	1.79	13	1.76	12
N	1.72	11	1.68	9.6	1.78	13	1.82	14	1.78	13	1.70	10	1.73	11	1.79	13	1.80	13	1.76	12
4	1.72	11	1.68	9.6	1.78	13	1.82	14	1.75	12	1.70	10	1.73	11	1.79	13	1.79	13	1.77	12
8	1.70	10	1.66	9.1	1.80	13	1.81	14	1.72	11	1.70	10	1.73	11	1.79	13	1.78	13	1.77	12
12	1.68	9.6	1.65	9.1	1.82	14	1.80	13	1.72	11	1.70	10	1.73	11	1.78	13	1.77	12	1.90	17



## Moses Lake at Moses Lake, Wash.

Location.- Lat.  $47^{\circ}06'$ , long.  $119^{\circ}20'$ , in NE $\frac{1}{4}$  sec. 32, T. 19 N., R. 28 E., at crossing of State Highway 18,  $1\frac{1}{2}$  miles uplake from mouth and 3 miles southwest of Moses Lake. Datum of gage is at mean sea level (Bureau of Reclamation bench mark).

Gage-height record.- Water-stage recorder graph.

Remarks.- Water surface controlled by dam at lake outlet. Many diversions for irrigation.

Mean elevation\*, in feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	45.60	45.89	47.35	11	45.67	46.13	47.14	21	45.81	47.08	46.94
2	45.60	45.90	47.33	12	45.67	46.18	47.11	22	45.83	47.15	46.92
3	45.60	45.90	47.31	13	45.67	46.23	47.08	23	45.84	47.20	46.88
4	45.62	45.90	47.28	14	45.67	46.29	47.04	24	45.86	47.26	46.85
5	45.63	45.90	47.26	15	45.68	46.39	47.01	25	45.87	47.31	46.82
6	45.65	45.90	47.25	16	45.68	46.54	46.98	26	45.87	47.34	46.79
7	45.65	45.93	47.23	17	45.67	46.68	46.97	27	45.87	47.37	46.75
8	45.65	45.96	47.21	18	45.69	46.81	46.97	28	45.87	47.33	46.72
9	45.65	45.99	47.19	19	45.73	46.91	46.97	29	45.88	47.39	46.69
10	45.66	46.05	47.17	20	45.79	47.00	46.95	30	45.89	47.38	46.63
								31	45.89		46.61

\* Add 1,000 feet to obtain elevation above mean sea level.

## Park Lake near Coulee City, Wash.

Location.- Lat.  $47^{\circ}35'$ , long.  $119^{\circ}24'$ , in NW $\frac{1}{4}$  sec. 14, T. 24 N., R. 27 E., 1 mile uplake from mouth and  $5\frac{1}{2}$  miles southwest of Coulee City. Datum of gage is at mean sea level (Bureau of Reclamation bench mark).

Gage-height record.- Staff gage read occasionally.

Remarks.- Some diversion from tributaries for irrigation.

Elevation, in feet, 1948

May 5	1,095.72	June 11	1,095.86	July 8	1,095.54
20	1,095.82	22	1,095.81	22	1,095.46

## Blue Lake near Coulee City, Wash.

Location.- Lat.  $47^{\circ}34'$ , long.  $119^{\circ}26'$ , in SE $\frac{1}{4}$  sec. 16, T. 24 N., R. 27 E.,  $2\frac{1}{2}$  miles uplake from mouth and 7 miles southwest of Coulee City. Datum of gage is at mean sea level (Bureau of Reclamation bench mark).

Gage-height record.- Staff gage read occasionally.

Remarks.- Some diversion from tributaries for irrigation.

Elevation, in feet, 1948

May 5	1,093.28	June 11	1,093.40	July 8	1,093.10
20	1,093.36	22	1,093.34	22	1,092.93

## Lenore Lake near Soap Lake, Wash.

Location.- Lat.  $47^{\circ}31'$ , long.  $119^{\circ}30'$ , in SW $\frac{1}{4}$  sec. 1, T. 23 N., R. 26 E.,  $5\frac{1}{2}$  miles uplake from mouth and 9 miles north of Soap Lake. Datum of gage is at mean sea level (Bureau of Reclamation bench mark).

Gage-height record.- Staff gage read occasionally.

Remarks.- Some diversion from tributaries for irrigation.

Elevation, in feet, 1948

May 5	1,080.71	June 11	1,081.45	July 8	1,081.59
20	1,081.00	22	1,081.67	22	1,081.50

## Soap Lake near Soap Lake, Wash.

Location.- Lat.  $47^{\circ}25'$ , long.  $119^{\circ}30'$ , in SE $\frac{1}{4}$  sec. 12, T. 22 N., R. 26 E.,  $1\frac{1}{2}$  miles uplake from mouth and 2 miles north of Soap Lake. Datum of gage is at mean sea level (Bureau of Reclamation bench mark).

Gage-height record.- Staff gage read occasionally.

Remarks.- Some diversion from tributaries for irrigation.

Elevation, in feet, 1948

May 5	1,072.94	June 11	1,073.30	July 8	1,073.21
20	1,073.12	22	1,073.37	22	1,073.11

Yakima River Basin

Keechelus Lake near Martin, Wash.

Location.- Lat. 47°19', long. 121°20', at dam on Yakima River in NE $\frac{1}{4}$  sec. 12, T. 21 N., R. 11 E., at outlet of Keechelus Lake, 3 $\frac{1}{2}$  miles northwest of Martin and 9 $\frac{1}{2}$  miles northwest of Easton. Datum of gage is at mean sea level (Bureau of Reclamation bench mark).

Drainage area.- 55 square miles.

Gage-height record.- Twice-daily staff-gage readings.

Remarks.- Reservoir is formed on natural lake by earth- and gravel-fill dam. Capacity, 153,000 acre-feet between gate sill (elevation, 2,425.00 feet), and spillway crest (elevation, 2,515.00 feet). Records given herein represent usable contents. Records furnished by Bureau of Reclamation, reviewed and prepared for publication by Geological Survey.

Mean elevation\*, in feet, and contents, in acre-feet, 1948

Day	May		June		July	
	Feet	Acre-feet	Feet	Acre-feet	Feet	Acre-feet
1	1.05	119,420	15.70	154,460	15.74	154,560
2	1.26	119,890	15.77	154,640	15.67	154,380
3	1.58	120,610	15.90	154,970	15.60	154,210
4	2.03	121,620	15.82	154,760	15.55	154,080
5	2.47	122,620	15.71	154,490	15.53	154,030
6	3.06	123,960	15.78	154,660	15.55	154,080
7	3.82	125,700	15.97	155,140	15.58	154,160
8	4.49	127,240	16.09	155,450	15.54	154,060
9	4.99	128,400	16.11	155,500	15.48	153,900
10	5.43	129,420	16.15	155,600	15.41	153,730
11	5.83	130,350	16.08	155,420	15.29	153,420
12	6.24	131,310	15.94	155,070	15.18	153,140
13	6.74	132,490	15.70	154,460	14.99	152,660
14	7.26	133,720	15.55	154,080	14.74	152,040
15	7.75	134,880	15.39	153,690	14.49	151,400
16	8.21	135,970	15.35	153,580	14.29	150,900
17	8.80	137,390	15.42	153,750	14.05	150,300
18	9.40	138,840	15.31	153,470	13.81	149,700
19	9.95	140,170	15.25	153,320	13.55	149,040
20	10.46	141,410	15.24	153,300	13.29	148,400
21	11.19	143,200	15.40	153,700	13.00	147,670
22	12.14	145,540	15.43	153,780	12.71	146,950
23	12.96	147,570	15.31	153,470	12.42	146,230
24	13.67	149,340	15.22	153,250	12.10	145,440
25	14.32	150,980	15.15	153,070	11.81	144,720
26	15.20	153,200	15.30	153,450	11.47	143,890
27	16.04	155,320	15.54	154,060	11.17	143,150
28	16.57	156,670	15.66	154,360	10.90	142,490
29	16.40	156,240	15.78	154,650	10.57	141,680
30	15.74	154,560	15.80	154,710	10.26	140,920
31	15.66	154,360			9.93	140,120
Change in contents, acre-feet		+35,430		+350		-14,590
Change in contents, equivalent mean second-feet		+576		+5.9		-237

\* Add 2,500 feet to obtain elevation above mean sea level.



## Yakima River near Martin, Wash.

**Location.**- Lat. 47°19'10", long. 121°20'10", just downstream from dam at outlet of Keechelus Lake, 3½ miles northwest of Martin, Kittitas County, and 12 miles upstream from Easton.

**Drainage area.**- 55 square miles.

**Gage-height record.**- Water-stage recorder graph.

**Discharge record.**- Stage-discharge relation defined by current-meter measurements. Gage-heights used to hundredths May 1 to June 21; hundredths below and half-tenths above 4.5 feet June 22 to July 30. Shifting-control method used May 1-24, July 9-31. Discharge 7 a.m. May 26 to noon July 13 is combined flow past gage and over lake spillway.

**Maxima.**- May-June 1948: Discharge, 4,150 second-feet 6:30 a.m. May 29 (gage height, 8.59 feet).

1903 to April 1948: Discharge, 7,370 second-feet Mar. 26, 1915, when temporary crib dam was washed out.

**Remarks.**- Flow regulated by Keechelus Lake. Figures of discharge not adjusted for change in contents of Keechelus Lake. Records collected and prepared in cooperation with Bureau of Reclamation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	4.9	1,370	642	11	6.2	1,970	433	21	220	1,050	554
2	4.9	1,490	552	12	6.2	1,720	467	22	146	1,080	554
3	5.9	1,670	467	13	6.2	1,410	500	23	147	974	554
4	6.5	1,530	411	14	6.2	1,200	554	24	432	910	554
5	6.2	1,400	389	15	6.5	1,040	554	25	813	642	554
6	7.2	1,490	411	16	6.5	1,010	554	26	965	293	554
7	6.5	1,770	445	17	6.9	1,060	554	27	1,920	413	554
8	6.5	1,950	400	18	6.7	992	554	28	3,170	540	554
9	6.2	1,990	393	19	.98	938	554	29	3,230	695	554
10	6.2	2,020	431	20	248	925	554	30	1,680	722	554
								31			
Monthly mean discharge, in second-feet.....									468	1,210	513
Runoff, in inches.....									9.81	24.52	10.76

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	2.23	6.9	2.23	6.9	2.22	6.5	4.01	147	5.01	311	4.02	148
8	2.23	6.9	2.23	6.9	2.22	6.5	4.02	148	5.01	311	4.02	148
N	2.23	6.9	2.22	6.5	4.00	146	5.00	309	3.92	135	3.99	144
4	2.23	6.9	2.22	6.5	4.07	155	5.01	311	3.99	144	3.98	143
8	2.23	6.9	2.22	6.5	4.01	147	5.01	311	4.00	146	4.00	146
12	2.23	6.9	2.22	6.5	4.01	147	5.01	311	4.01	147	4.00	146
	May 23		May 24		May 25		May 26		May 27		May 28	
4	4.01	147	4.01	147	7.05	822	7.04	818	7.07	1,490	7.09	2,760
8	4.01	147	4.01	147	7.02	812	7.04	835	7.07	1,680	7.10	2,920
N	4.00	146	5.40	393	7.01	809	7.04	908	7.07	1,990	7.11	2,980
4	4.00	146	6.25	592	7.01	809	7.04	1,010	7.07	2,110	8.32	3,490
8	4.01	147	7.04	818	7.02	812	7.05	1,150	7.08	2,320	8.57	3,720
12	4.01	147	7.04	818	7.03	815	7.06	1,320	7.08	2,550	8.58	3,920
	May 29		May 30		May 31		June 1		June 2		June 3	
4	8.58	4,110	8.59	2,100	7.00	1,310	7.01	1,350	7.01	1,430	7.02	1,700
8	8.59	3,820	8.58	2,040	7.00	1,310	7.01	1,360	7.01	1,450	7.02	1,740
N	8.59	3,170	7.27	1,540	7.00	1,320	7.00	1,360	7.00	1,480	7.02	1,710
4	8.60	2,720	6.99	1,380	6.98	1,320	6.99	1,380	7.00	1,520	7.00	1,630
8	8.60	2,400	7.00	1,350	7.00	1,320	7.00	1,380	7.01	1,560	7.00	1,620
12	8.59	2,230	7.00	1,310	7.01	1,340	7.01	1,390	7.02	1,600	7.00	1,590
	June 4		June 5		June 6		June 7		June 8		June 9	
4	7.00	1,560	7.00	1,460	7.00	1,420	7.01	1,660	7.02	1,920	7.02	1,980
8	7.00	1,550	7.00	1,340	7.00	1,450	7.01	1,720	7.02	1,930	7.02	1,980
N	7.00	1,530	6.99	1,410	6.99	1,490	7.01	1,770	7.01	1,950	7.00	1,980
4	7.00	1,520	6.98	1,390	6.99	1,530	7.00	1,820	7.00	1,970	7.00	2,000
8	7.00	1,490	6.98	1,380	7.00	1,560	7.01	1,880	7.01	1,980	7.01	2,000
12	7.00	1,480	7.00	1,380	7.01	1,610	7.02	1,920	7.02	1,980	7.01	2,000
	June 10		June 11		June 12		June 13		June 14		June 15	
4	7.01	2,020	7.00	2,020	7.01	1,830	7.01	1,490	7.00	1,260	7.00	1,090
8	7.00	2,020	7.00	1,980	7.01	1,790	7.01	1,450	7.00	1,230	7.00	1,050
N	7.00	2,030	7.00	1,970	7.00	1,710	7.00	1,410	7.00	1,210	7.00	1,030
4	7.00	2,030	7.01	1,950	7.00	1,660	7.00	1,370	7.00	1,170	6.99	1,010
8	7.00	2,030	7.01	1,920	7.01	1,610	7.00	1,340	7.00	1,140	6.99	989
12	7.00	2,030	7.01	1,880	7.01	1,550	7.00	1,300	7.00	1,110	6.99	989
	June 16		June 17		June 18		June 19		June 20		June 21	
4	6.99	989	7.00	1,060	7.00	1,020	6.99	956	6.99	928	6.99	963
8	6.99	997	7.00	1,080	7.00	1,000	6.99	942	6.99	921	7.00	1,000
N	6.99	1,000	7.00	1,080	7.00	992	6.99	928	6.99	921	7.01	1,050
4	7.00	1,020	7.00	1,060	6.99	980	6.99	928	6.99	921	7.01	1,090
8	7.00	1,030	7.00	1,040	6.99	963	6.99	928	6.99	928	7.01	1,130
12	7.00	1,050	7.00	1,030	6.99	963	6.99	928	6.99	935	7.01	1,150

**Supplemental record.**- May 19, 9 a.m., 2.22 ft., 6.5 sec.-ft., 10 a.m., 4.65 ft., 247 sec.-ft., 11 a.m., 4.20 ft., 174 sec.-ft.; May 20, 9 a.m., 4.02 ft., 148 sec.-ft., 10 a.m., 5.23 ft., 350 sec.-ft., 11 a.m., 5.02 ft., 312 sec.-ft.; May 21, 10 a.m., 5.01 ft., 311 sec.-ft.; May 24, 10 a.m., 4.01 ft., 147 sec.-ft., 2 p.m., 6.02 ft., 534 sec.-ft., 6 p.m., 7.00 ft., 806 sec.-ft.; May 28, 2 p.m., 7.11 ft., 2,980 sec.-ft., 6 p.m., 8.55 ft., 3,640 sec.-ft.; May 29, 6:30 a.m., 8.59 ft., 4,150 sec.-ft.; May 30, 10 a.m., 7.75 ft., 1,700 sec.-ft., 2 p.m., 6.97 ft., 1,400 sec.-ft.

## Yakima River at Cle Elum, Wash.

Location.- Lat. 47°11'20", long. 120°56'40", in sec. 27, T. 20 N., R. 15 E., at highway bridge at Cle Elum, just upstream from Roslyn Creek and 7 miles upstream from Teanaway River.

Drainage area.- 500 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 13,200 second-feet and extended to peak stage. Gage heights used to hundredths May 17 to June 21; half-tenths 5.5 to 8.3 feet, hundredths below and tenths above these limits May 1-16, June 22 to July 31. Shifting-control method used May 31 to July 31.

Maxima.- May-June 1948: Discharge, 16,700 second-feet 7 to 11 a.m. May 29 (gage height, 12.31 feet).

1906 to April 1948: Discharge, 25,600 second-feet Nov. 14, 1906 (gage height, 12.5 feet, from floodmarks).

Remarks.- Kittitas Canal diverts water above station for irrigation. Flow partly regulated by Keechelus, Kachess, and Cle Elum Lakes. Figures of discharge not adjusted for diversion or change in contents of lakes (average discharge, May 147 second-feet; June 485 second-feet; July 1,058 second-feet). Records collected in cooperation with Bureau of Reclamation.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	811	9,840	2,720	11	1,680	10,400	2,660	21	3,860	5,070	2,670
2	740	9,780	2,490	12	1,850	10,200	2,670	22	2,600	5,100	2,700
3	718	10,400	3,430	13	2,030	8,640	2,670	23	2,320	4,870	2,860
4	835	10,500	4,000	14	2,150	6,930	2,730	24	2,660	4,540	2,940
5	876	10,500	3,970	15	2,220	5,600	2,760	25	6,050	3,850	2,970
6	1,120	11,000	3,190	16	2,280	4,920	2,780	26	8,790	2,970	2,940
7	1,470	11,200	2,640	17	2,510	5,790	2,750	27	10,600	2,670	3,000
8	1,520	11,300	2,580	18	2,660	5,810	2,730	28	14,500	2,680	3,070
9	1,620	11,400	2,540	19	2,840	5,570	2,720	29	16,300	2,760	3,050
10	1,620	10,900	2,600	20	3,640	5,140	2,660	30	13,700	2,810	3,020
								31	11,200		3,050
Monthly mean discharge, in second-feet.....									4,115	7,105	2,889
Runoff, in inches.....									9.49	15.85	6.66

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Gage height, in feet, and discharge, in second-feet, at Indian Lake, 1930												
Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	6.63	2,450	6.77	2,660	6.80	2,700	7.19	3,340	7.71	4,320	6.76	2,640
8	6.65	2,480	6.79	2,680	6.82	2,730	7.28	3,500	7.76	4,420	6.78	2,640
N	6.67	2,510	6.79	2,680	6.83	2,750	7.34	3,610	7.79	4,480	6.75	2,620
4	6.68	2,520	6.74	2,610	6.91	2,880	7.42	3,760	7.33	3,590	6.72	2,580
8	6.73	2,600	6.77	2,660	7.02	3,050	7.53	3,970	6.84	2,760	6.70	2,550
12	6.75	2,620	6.78	2,670	7.10	3,190	7.63	4,160	6.73	2,600	6.65	2,480
	May 23		May 24		May 25		May 26		May 27		May 28	
4	6.61	2,420	6.46	2,230	7.78	4,460	9.60	8,770	9.86	9,430	11.00	12,800
8	6.54	2,330	6.45	2,220	7.92	4,740	9.60	8,770	10.02	9,940	11.17	13,300
N	3.53	2,320	6.44	2,200	8.10	5,120	9.60	8,770	10.22	10,500	11.40	14,000
4	6.49	2,270	6.72	2,580	9.07	7,380	9.59	8,740	10.40	11,000	11.79	15,200
8	6.46	2,230	7.34	3,610	9.41	8,260	9.61	8,800	10.64	11,700	12.00	15,800
12	6.46	2,230	7.56	4,020	9.52	8,550	9.75	9,180	10.90	12,500	12.21	16,400
	May 29		May 30		May 31		June 1		June 2		June 3	
4	12.29	16,700	11.49	14,300	10.80	11,300	10.65	9,880	10.58	9,660	10.70	9,970
8	12.31	16,700	11.46	14,200	10.79	11,200	10.65	9,880	10.63	9,800	10.73	10,100
N	12.30	16,700	11.35	13,800	10.81	11,300	10.54	9,570	10.65	9,850	10.87	10,500
4	12.20	16,400	11.19	13,400	10.59	10,700	10.63	9,820	10.61	9,740	10.90	10,500
8	11.90	15,500	11.09	13,100	10.62	10,800	10.58	9,680	10.63	9,800	10.95	10,700
12	11.60	14,600	10.95	12,600	10.64	10,800	10.58	9,680	10.68	9,940	10.98	10,800
	June 4		June 5		June 6		June 7		June 8		June 9	
4	10.89	10,500	10.85	10,300	10.98	10,700	11.18	11,200	11.20	11,200	11.24	11,300
8	10.91	10,500	10.83	10,300	10.97	10,700	11.20	11,300	11.21	11,200	11.24	11,300
N	10.88	10,500	10.88	10,400	11.18	11,300	11.20	11,300	11.24	11,300	11.26	11,300
4	10.85	10,400	10.96	10,700	11.18	11,300	11.19	11,200	11.24	11,300	11.31	11,500
8	10.88	10,500	11.01	10,800	11.16	11,200	11.16	11,200	11.23	11,300	11.28	11,400
12	10.89	10,500	11.01	10,800	11.15	11,200	11.20	11,300	11.24	11,300	11.24	11,300
	June 10		June 11		June 12		June 13		June 14		June 15	
4	11.22	11,200	10.94	10,300	10.99	10,400	10.67	9,400	9.94	7,400	9.47	6,210
8	11.23	11,200	10.98	10,400	10.96	10,300	10.61	9,240	9.92	7,350	9.45	6,160
N	11.20	11,100	10.99	10,400	10.90	10,100	10.40	8,660	9.72	6,850	9.17	5,530
4	11.11	10,800	11.03	10,500	10.88	10,100	10.24	8,230	9.61	6,590	9.11	5,400
8	10.94	10,300	11.02	10,500	10.83	9,910	10.02	7,660	9.55	6,450	8.81	4,760
12	10.92	10,300	11.01	10,500	10.80	9,820	9.95	7,480	9.51	6,350	8.78	4,700
	June 16		June 17		June 18		June 19		June 20		June 21	
4	8.74	4,580	9.20	5,510	9.40	5,910	9.30	5,640	9.21	5,400	9.04	4,990
8	8.73	4,560	9.18	5,460	9.38	5,860	9.28	5,590	9.21	5,400	9.06	5,040
N	8.75	4,600	9.40	5,950	9.36	5,820	9.27	5,570	9.02	4,990	9.08	5,080
4	9.08	5,290	9.43	6,020	9.32	5,730	9.26	5,550	8.98	4,910	9.11	5,140
8	9.14	5,420	9.44	6,050	9.31	5,700	9.24	5,510	8.99	4,930	9.11	5,140
12	9.17	5,480	9.42	6,000	9.31	5,700	9.21	5,440	9.00	4,950	9.11	5,140

Supplemental record.- May 21, 2 p.m., 7.80 ft., 4,500 sec.-ft.; May 25, 6 p.m., 9.30 ft., 7,970 sec.-ft.; May 29, 2 p.m., 12.29 ft., 16,700 sec.-ft.; May 31, 10 a.m., 11.02 ft., 11,900 sec.-ft.

## Yakima River at Umtanum, Wash.

Location.- Lat. 46°51'45", long. 120°28'30", in NW¼ sec. 20, T. 16 N., R. 19 E., at Umtanum, half a mile upstream from Umtanum Creek and 10 miles south of Ellensburg. Datum of gage is 1,300.0 feet above mean sea level, datum of 1929.

Drainage area.- 1,620 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 22,800 second-feet and extended to peak stage. Gage heights used to hundredths May 17 to June 21; half-tenths between 31.6 feet and 34.2 feet, hundredths below and tenths above these limits May 1-16, June 22 to July 31.

Maxima.- May-June 1948: Discharge, 27,700 second-feet 6 p.m. May 29 (gage height, 38.98 feet).

1906 to April 1948: Discharge, 41,000 second-feet Nov. 15 or 16, 1906 (gage height, 41.1 feet, from floodmarks, present datum).

Remarks.- Flow partly regulated by Keechelus, Kachess, and Cle Elum Lakes. Water diverted above station for irrigation of about 91,000 acres. Figures of discharge not adjusted for diversion or change in contents of lakes. Records collected and prepared in cooperation with Bureau of Reclamation.

## Mean discharge, in second-feet, 1948

mean discharge, in second-feet, 1940											
Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2,040	14,100	3,390	11	3,910	12,500	3,190	21	8,400	7,010	3,000
2	1,940	13,000	3,190	12	3,910	12,500	3,190	22	7,460	6,820	3,000
3	1,940	12,600	3,290	13	4,240	11,400	3,100	23	6,890	6,520	3,000
4	2,540	12,700	4,240	14	4,360	9,420	3,100	24	6,490	6,100	3,190
5	2,630	12,200	4,240	15	4,130	8,060	3,100	25	7,960	5,440	3,190
6	3,100	12,400	4,240	16	4,360	7,370	3,100	26	11,600	4,580	3,190
7	4,580	12,800	3,290	17	4,600	8,750	3,000	27	13,800	4,020	3,190
8	4,360	12,800	3,290	18	4,730	8,440	3,100	28	18,500	3,800	3,190
9	4,020	12,700	3,190	19	4,790	7,840	3,190	29	26,200	3,700	3,190
10	4,020	12,500	3,100	20	6,650	7,490	3,100	30	22,700	3,590	3,190
								31	17,000		3,190
Monthly mean discharge, in second-feet .....									7,221	9,105	3,263
Runoff, in inches .....									5.14	6.27	2.32

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	32.91	4,490	33.00	4,700	32.99	4,690	33.34	5,540	34.23	8,160	34.07	7,640
8	32.93	4,540	33.02	4,750	33.02	4,750	33.56	6,130	34.32	8,440	34.02	7,480
N	32.99	4,680	33.03	4,770	33.04	4,800	33.80	6,820	34.38	8,640	34.01	7,450
4	33.00	4,700	33.03	4,770	33.05	4,820	34.00	7,420	34.39	8,670	33.98	7,360
8	32.98	4,650	33.02	4,750	33.05	4,820	34.06	7,610	34.33	8,480	33.92	7,180
12	32.97	4,630	33.00	4,700	33.14	5,040	34.11	7,770	34.27	8,280	33.86	7,000
	May 23		May 24		May 25		May 26		May 27		May 28	
4	33.88	7,060	33.63	6,320	33.87	7,030	34.81	10,100	35.61	13,100	36.34	16,100
8	33.91	7,150	33.67	6,440	34.10	7,740	35.14	11,300	35.68	13,400	36.56	17,000
N	33.88	7,060	33.74	6,640	34.26	8,250	35.38	12,200	35.78	13,800	36.90	18,400
4	33.80	6,820	33.73	6,610	34.32	8,440	35.51	12,700	35.90	14,300	37.16	19,500
8	33.72	6,580	33.68	6,460	34.34	8,510	35.51	12,700	35.99	14,700	37.58	21,400
12	33.65	6,380	33.72	6,580	34.47	8,940	35.53	12,800	36.03	14,800	37.81	22,400
	May 29		May 30		May 31		June 1		June 2		June 3	
4	38.35	24,800	38.63	28,200	38.81	18,300	35.96	14,500	35.63	13,200	35.48	12,600
8	38.58	25,900	38.29	24,500	36.72	17,700	35.91	14,300	35.61	13,100	35.51	12,700
N	38.81	26,900	37.68	21,800	36.55	17,000	35.86	14,100	35.58	13,000	35.51	12,700
4	38.89	27,300	37.38	20,500	36.35	16,100	35.80	13,900	35.54	12,900	35.48	12,600
8	38.96	27,600	37.24	19,900	36.25	15,700	35.70	13,500	35.50	12,700	35.46	12,500
12	38.84	27,100	37.08	19,200	36.08	15,000	35.66	13,300	35.48	12,600	35.50	12,700
	June 4		June 5		June 6		June 7		June 8		June 9	
4	35.53	12,800	35.39	12,300	35.39	12,300	35.50	12,700	35.49	12,700	35.50	12,700
8	35.52	12,800	35.41	12,300	35.44	12,500	35.54	12,900	35.53	12,800	35.53	12,800
N	35.53	12,800	35.39	12,300	35.47	12,600	35.58	13,000	35.57	13,000	35.54	12,900
4	35.50	12,700	35.38	12,200	35.43	12,400	35.54	12,900	35.58	13,000	35.51	12,700
8	35.46	12,500	35.32	12,000	35.41	12,300	35.51	12,700	35.55	12,900	35.50	12,700
12	35.40	12,300	35.33	12,000	35.50	12,700	35.49	12,700	35.48	12,700	35.48	12,600
	June 10		June 11		June 12		June 13		June 14		June 15	
4	35.49	12,700	35.38	12,200	35.60	13,100	35.22	11,600	34.76	9,940	34.30	8,380
8	35.49	12,700	35.36	12,100	35.55	12,900	35.26	11,800	34.66	9,580	34.27	8,280
N	35.45	12,500	35.41	12,300	35.48	12,600	35.19	11,500	34.61	9,410	34.22	8,120
4	35.42	12,400	35.51	12,700	35.38	12,200	35.12	11,200	34.55	9,210	34.18	8,000
8	35.37	12,200	35.60	13,100	35.31	12,000	35.03	10,900	34.44	8,840	34.06	7,610
12	35.40	12,300	35.60	13,100	35.27	11,600	34.92	10,500	34.36	8,570	34.00	7,420
	June 16		June 17		June 18		June 19		June 20		June 21	
4	33.88	7,060	34.44	8,840	34.39	8,670	34.17	7,960	34.05	7,560	33.88	7,060
8	33.83	6,910	34.45	8,870	34.38	8,640	34.16	7,930	34.05	7,580	33.88	7,060
N	33.88	7,060	34.43	8,800	34.34	8,500	34.15	7,900	34.05	7,580	33.88	7,060
4	33.98	7,360	34.38	8,640	34.29	8,350	34.10	7,740	34.05	7,580	33.85	6,970
8	34.13	7,840	34.40	8,700	34.22	8,120	34.08	7,680	33.95	7,270	33.83	6,910
12	34.36	8,570	34.40	8,700	34.20	8,060	34.05	7,580	33.90	7,120	33.82	6,880

Supplemental record.- May 29, 6 p.m., 38.98 ft., 27,700 sec.-ft.

## Yakima River near Parker, Wash.

Location.- Lat. 46°29'40", long. 120°26'10", in sec. 28, T. 12 N., R. 19 E., just downstream from Sunnyside diversion dam, 1½ miles east of Parker, and 3 miles downstream from Ahtanum Creek.

Drainage area.- 3,560 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements. Gage heights used to hundredths May 17 to June 21; half tenths between 3.3 feet and 5.8 feet, hundredths below and tenths above these limits May 1-16, June 22 to July 31. Shifting-control method used July 7-31.

Maxima.- May-June 1948: Discharge, 37,700 second-feet 10 p.m. May 29 (gage height, 13.82 feet).

1908-21, 1931 to April 1948: Discharge, 54,300 second-feet Dec. 23, 1933 (gage height, 15.0 feet, from floodmarks).

Remarks.- Flow partly regulated by diversions and by Keechelus, Kachess, Cle Elum, and Bumping Lakes. New Reservation, Old Reservation, Roza (Yakima Ridge), Sunnyside, and Union Gap Canals divert above station for irrigation (average total discharge, May, 3,647 second-feet; June, 3,504 second-feet; July, 3,919 second-feet). Figures of discharge not adjusted for diversions or change in contents of reservoirs. Records collected and prepared in cooperation with Bureau of Reclamation and Office of Indian Affairs.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	320	17,800	2,960	11	2,760	19,000	236	21	10,100	9,650	207
2	345	16,500	2,450	12	2,760	19,700	224	22	11,000	9,070	165
3	499	17,200	2,000	13	3,160	16,500	142	23	10,400	8,070	96
4	998	18,600	2,700	14	3,300	13,600	187	24	9,770	7,150	207
5	1,580	17,700	3,020	15	3,090	11,000	350	25	12,300	6,510	277
6	1,850	17,400	3,090	16	3,680	10,100	356	26	17,100	5,510	264
7	3,570	18,500	2,100	17	3,630	11,700	320	27	22,600	4,590	142
8	3,680	19,000	1,470	18	4,160	11,600	436	28	27,600	4,000	277
9	3,160	19,000	772	19	4,350	10,600	646	29	35,400	3,160	340
10	2,960	18,300	325	20	6,260	10,000	448	30	33,100	3,300	136
								31	23,200		73
Monthly mean discharge, in second-feet .....									8,660	12,490	852
Runoff, in inches .....									2.80	3.92	0.28

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	5.31	3,460	5.68	4,050	5.78	4,220	6.16	4,880	8.11	9,100	8.85	11,200
8	5.35	3,520	5.72	4,110	5.77	4,200	6.34	5,210	8.33	9,680	8.88	11,300
N	5.42	3,650	5.79	4,230	5.86	4,350	6.77	6,040	8.53	10,200	8.81	11,100
4	5.46	3,700	5.82	4,280	5.90	4,420	7.22	6,970	8.75	10,900	8.74	10,900
8	5.56	3,860	5.81	4,270	5.94	4,490	7.61	7,850	8.81	11,100	8.72	10,800
12	5.56	3,860	5.78	4,220	6.03	4,640	7.91	8,580	8.84	11,200	8.68	10,700
	May 23		May 24		May 25		May 26		May 27		May 28	
4	8.65	10,600	8.33	9,680	8.60	10,400	9.83	14,900	11.40	22,100	12.00	25,100
8	8.60	10,400	8.30	9,600	8.89	11,300	9.96	15,400	11.32	21,700	12.12	25,800
N	8.62	10,500	8.33	9,680	9.14	12,200	10.27	16,700	11.39	22,000	12.36	27,300
4	8.62	10,500	8.37	9,800	9.44	13,400	10.60	18,100	11.57	23,000	12.57	28,500
8	8.54	10,300	8.38	9,820	9.63	14,100	10.87	19,400	11.75	23,800	12.90	30,700
12	8.41	9,910	8.51	10,200	9.73	14,500	11.27	21,400	11.86	24,400	13.15	32,400
	May 29		May 30		May 31		June 1		June 2		June 3	
4	13.31	33,600	13.66	36,400	12.07	25,500	10.72	18,700	10.23	16,500	10.25	16,600
8	13.34	33,800	13.50	35,100	11.85	24,400	10.58	18,000	10.20	16,400	10.33	16,900
N	13.60	35,900	13.31	33,600	11.60	23,100	10.47	17,500	10.26	16,600	10.38	17,100
4	13.74	37,000	13.08	32,000	11.35	21,800	10.41	17,200	10.22	16,500	10.50	17,600
8	13.78	37,300	12.67	29,100	11.10	20,600	10.37	17,100	10.21	16,400	10.56	17,900
12	13.77	37,300	12.34	27,100	10.96	19,900	10.28	16,700	10.20	16,400	10.64	18,300
	June 4		June 5		June 6		June 7		June 8		June 9	
4	10.65	18,400	10.57	18,000	10.38	17,100	10.55	17,800	10.74	18,800	10.80	19,100
8	10.73	18,800	10.52	17,700	10.40	17,200	10.64	18,300	10.73	18,800	10.80	19,100
N	10.75	18,800	10.50	17,600	10.48	17,500	10.72	18,700	10.76	18,900	10.78	19,000
4	10.75	18,800	10.50	17,600	10.52	17,700	10.77	19,000	10.80	19,100	10.77	19,000
8	10.71	18,600	10.45	17,400	10.53	17,800	10.79	19,000	10.82	19,200	10.72	18,700
12	10.64	18,300	10.40	17,200	10.50	17,600	10.77	19,000	10.82	19,200	10.76	18,900
	June 10		June 11		June 12		June 13		June 14		June 15	
4	10.70	18,600	10.72	18,700	11.07	20,400	10.45	17,400	9.83	14,900	8.94	11,500
8	10.68	18,500	10.72	18,700	11.07	20,400	10.34	17,000	9.66	14,200	8.83	11,200
N	10.63	18,200	10.75	18,800	11.01	20,200	10.21	16,400	9.48	13,500	8.79	11,000
4	10.63	18,200	10.79	19,000	10.89	19,600	10.10	16,000	9.32	12,900	8.67	10,700
8	10.58	18,000	10.92	19,700	10.74	18,800	10.03	15,700	9.25	12,600	8.59	10,400
12	10.59	18,000	11.00	20,100	10.57	18,000	9.95	15,400	9.12	12,100	8.51	10,200
	June 16		June 17		June 18		June 19		June 20		June 21	
4	8.50	10,200	8.83	11,200	8.95	11,500	8.76	10,900	8.47	10,100	8.38	9,820
8	8.45	10,000	9.03	11,800	8.95	11,500	8.69	10,700	8.41	9,910	8.32	9,660
N	8.41	9,910	9.10	12,000	9.02	11,800	8.65	10,600	8.42	9,940	8.30	9,600
4	8.45	10,000	9.12	12,100	9.00	11,700	8.61	10,500	8.45	10,000	8.31	9,630
8	8.54	10,300	9.08	12,000	8.95	11,500	8.58	10,400	8.43	9,960	8.27	9,520
12	8.65	10,600	8.99	11,700	8.85	11,200	8.51	10,200	8.43	9,960	8.22	9,380

Supplemental record.- May 29, 10 p.m., 13.82 ft., 37,700 sec.-ft.

## Yakima River at Kiona, Wash.

Location.- Lat. 46°15'10", long. 119°28'50", in sec. 19, T. 9 N., R. 27 E., at high-way bridge at Kiona, 3½ miles downstream from intake of Kiona Canal and 25 miles upstream from mouth.

Drainage area.- 5,520 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Gage heights used to hundredths May 17 to June 21; half-tenths below and tenths above 5.6 feet May 1-16, June 22 to July 31.

Maxima.- May-June 1948: Discharge, 37,900 second-feet 8 a.m. May 31 (gage height, 17.20 feet).

1896-1915, 1933 to April 1948: Discharge, 71,100 second-feet Dec. 23, 1933 (gage height, 21.57 feet).

The flood of Dec. 23, 1933 is the greatest known since 1896.

Remarks.- Water diverted above station for irrigation of approximately 425,000 acres. Flow partly regulated by diversions and by Keechelus, Kachess, Cle Elum, and Bumping Lakes, and Tieton Reservoir. Records collected and prepared in cooperation with Bureau of Reclamation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2,220	29,900	4,860	11	4,860	20,900	2,480	21	8,500	14,600	2,100
2	1,920	23,900	4,360	12	4,860	21,000	2,220	22	11,200	13,400	1,920
3	1,860	21,000	3,800	13	4,860	21,900	2,100	23	12,400	12,700	1,760
4	1,920	19,900	3,420	14	5,370	20,000	1,980	24	12,800	11,600	1,760
5	2,290	20,300	4,040	15	5,550	18,500	1,860	25	12,500	10,200	1,860
6	2,970	20,300	4,520	16	5,550	16,300	1,920	26	12,800	9,200	1,980
7	3,420	19,700	4,690	17	5,840	15,100	1,920	27	14,600	7,990	1,980
8	4,860	19,900	3,800	18	6,030	15,400	1,860	28	18,700	6,830	1,920
9	5,200	20,400	3,200	19	6,510	15,800	1,920	29	23,000	5,910	1,920
10	5,030	20,800	2,830	20	6,920	15,100	2,160	30	32,500	5,030	1,980
								31	36,800		1,860
Monthly mean discharge, in second-feet.									9,150	16,470	2,610
Runoff, in inches.									1.91	3.33	0.55

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	6.82	6,130	6.68	5,870	6.96	6,380	7.14	6,720	7.56	7,510	8.97	10,400
8	6.71	5,930	6.71	5,930	7.00	6,450	7.18	6,790	7.75	7,890	9.25	11,000
N	6.59	5,710	6.76	6,020	7.03	6,510	7.24	6,910	8.01	8,410	9.39	11,300
4	6.57	5,680	6.82	6,130	7.09	6,620	7.30	7,020	8.50	8,990	9.49	11,500
8	6.58	5,690	6.86	6,200	7.09	6,620	7.34	7,100	8.57	9,560	9.60	11,800
12	6.63	5,780	6.93	6,320	7.11	6,660	7.44	7,290	8.77	9,980	9.68	12,000
	May 23		May 24		May 25		May 26		May 27		May 28	
4	9.75	12,100	10.03	12,800	9.95	12,600	9.90	12,600	10.45	13,800	11.94	17,400
8	9.81	12,300	10.04	12,800	9.89	12,500	9.94	12,500	10.57	14,000	12.20	18,100
N	9.87	12,400	10.05	12,800	9.86	12,400	10.02	12,800	10.68	14,300	12.44	18,100
4	9.92	12,500	10.06	12,800	9.85	12,400	10.11	13,000	10.80	14,600	12.62	19,300
8	9.97	12,600	10.06	12,800	9.85	12,400	10.21	13,200	11.44	16,200	12.84	19,900
12	10.01	12,700	10.03	12,800	9.86	12,400	10.33	13,500	11.65	16,700	13.08	20,700
	May 29		May 30		May 31		June 1		June 2		June 3	
4	13.28	21,300	15.30	28,800	17.14	37,600	16.12	32,500	14.45	25,400	13.56	21,600
8	13.44	21,800	15.74	30,800	17.20	37,900	15.80	31,000	14.22	24,600	13.26	21,200
N	13.62	22,400	16.13	32,600	17.10	37,400	15.50	29,700	14.00	23,800	13.14	20,800
4	13.98	23,700	16.44	34,000	16.98	36,800	15.22	28,500	13.80	23,000	13.07	20,600
8	14.38	25,200	16.74	35,500	16.72	35,400	14.94	27,400	13.66	22,600	13.00	20,400
12	14.83	26,900	17.01	36,900	16.42	33,900	14.69	26,400	13.50	22,000	12.92	20,200
	June 4		June 5		June 6		June 7		June 8		June 9	
4	12.86	20,000	12.89	20,100	13.06	20,600	12.82	19,900	12.77	19,700	12.96	20,300
8	12.82	19,900	12.93	20,200	13.01	20,400	12.77	19,700	12.80	19,800	12.99	20,400
N	12.80	19,800	12.97	20,300	12.96	20,300	12.76	19,700	12.82	19,900	12.98	20,300
4	12.80	19,800	13.01	20,400	12.92	20,200	12.74	19,600	12.85	20,000	12.98	20,300
8	12.82	19,900	13.04	20,500	12.89	20,100	12.75	19,600	12.90	20,100	13.00	20,400
12	12.85	20,000	13.06	20,600	12.85	20,000	12.76	19,700	12.92	20,200	13.06	20,600
	June 10		June 11		June 12		June 13		June 14		June 15	
4	13.09	20,700	13.16	20,900	13.15	20,900	13.40	21,700	13.58	21,600	12.60	19,200
8	13.13	20,800	13.16	20,900	13.16	20,900	13.44	21,800	13.24	21,200	12.48	18,900
N	13.17	20,900	13.15	20,900	13.16	20,900	13.50	22,000	13.11	20,800	12.34	18,500
4	13.17	20,900	13.16	20,900	13.17	20,900	13.52	22,100	12.97	20,300	12.22	18,200
8	13.16	20,900	13.15	20,900	13.21	21,100	13.56	22,200	12.84	19,900	12.08	17,800
12	13.16	20,900	13.16	20,900	13.30	21,400	13.49	22,000	12.73	19,600	12.00	17,600
	June 16		June 17		June 18		June 19		June 20		June 21	
4	11.73	16,900	11.09	15,300	11.00	15,100	11.30	15,800	11.14	15,400	10.74	14,500
8	11.58	16,500	11.04	15,200	11.06	15,200	11.31	15,800	11.06	15,200	10.68	14,300
N	11.44	16,200	11.00	15,100	11.13	15,400	11.31	15,800	10.99	15,100	10.65	14,200
4	11.41	16,100	10.98	15,000	11.19	15,500	11.30	15,800	10.90	14,800	10.63	14,200
8	11.23	15,600	10.97	15,000	11.26	15,700	11.28	15,800	10.84	14,700	10.60	14,100
12	11.15	15,400	10.97	15,000	11.29	15,800	11.24	15,700	10.78	14,600	10.54	14,000

Supplemental record.- May 17, 2 a.m., 6.81 ft., 6,110 sec.-ft.; May 22, 5:30 a.m., 9.00 ft., 10,500 sec.-ft., 6 a.m., 9.12 ft., 10,700 sec.-ft., 6 p.m., 9.57 ft., 11,700 sec.-ft.; May 27, 7 p.m., 10.93 ft., 14,900 sec.-ft., May 31, 2 a.m., 17.10 ft., 37,400 sec.-ft., 6 a.m., 17.18 ft., 37,800 sec.-ft., 10 a.m., 17.18 ft., 37,800 sec.-ft., 2 p.m., 17.06 ft., 37,200 sec.-ft., 6 p.m., 16.67 ft., 36,200 sec.-ft., 10 p.m., 16.60 ft., 34,800 sec.-ft.; June 16, 4 a.m., 11.73 ft., 16,900 sec.-ft.

## Kachess Lake near Easton, Wash.

Location.- Lat. 47°16', long. 121°12', at dam on Kachess River in SW $\frac{1}{4}$  sec. 34, T. 21 N., R. 13 E., at outlet of Kachess Lake, 2 $\frac{1}{2}$  miles northwest of Easton. Datum of gage is at mean sea level (Bureau of Reclamation bench mark).

Drainage area.- 64 square miles.

Gage-height record.- Twice-daily staff-gage readings.

Remarks.- Reservoir is formed on natural lake by earth- and gravel-fill dam. Capacity, 239,000 acre-feet between gate sill (elevation, 2,192.75 feet) and top of spillway gate (elevation, 2,262.00 feet). Records given herein represent usable contents. Records furnished by Bureau of Reclamation, reviewed and prepared for publication by Geological Survey.

Mean elevation\*, in feet, and contents, in acre-feet, 1948

Day	May		June		July	
	Feet	Acre-feet	Feet	Acre-feet	Feet	Acre-feet
1	55.49	209,980	59.75	228,840	61.89	238,480
2	55.47	209,900	60.03	230,100	61.78	237,980
3	55.51	210,070	60.25	231,080	61.62	237,260
4	55.59	210,420	60.42	231,850	61.34	235,990
5	55.68	210,820	60.50	232,210	61.07	234,770
6	55.77	211,210	60.68	233,020	60.82	233,650
7	55.94	211,960	60.86	233,830	60.55	232,430
8	56.03	212,350	61.08	234,820	60.23	230,990
9	56.09	212,620	61.27	235,680	59.94	229,690
10	56.11	212,700	61.40	236,260	59.72	228,700
11	56.09	212,620	61.53	236,850	59.43	227,410
12	56.09	212,620	61.62	237,260	59.14	226,110
13	56.13	212,790	61.56	236,980	58.85	224,820
14	56.17	212,970	61.58	237,080	58.57	223,570
15	56.16	212,920	61.58	237,080	58.28	222,190
16	56.17	212,970	61.65	237,390	57.94	220,770
17	56.19	213,050	61.81	238,120	57.66	219,530
18	56.25	213,320	61.86	238,340	57.39	218,340
19	56.28	213,450	61.90	238,530	57.10	217,060
20	56.41	214,020	61.97	238,840	56.76	215,560
21	56.68	215,210	62.08	239,340	56.45	214,200
22	57.17	217,370	62.13	239,570	56.13	212,790
23	57.65	219,490	62.16	239,710	55.80	211,340
24	58.09	221,440	62.18	239,800	55.44	209,770
25	58.44	223,000	62.10	239,430	55.08	208,200
26	58.90	225,040	62.05	239,210	54.74	206,720
27	59.44	227,450	62.00	238,980	54.38	205,150
28	60.31	231,350	61.98	238,890	54.05	203,720
29	60.47	232,070	61.99	238,940	53.69	202,160
30	60.15	230,630	61.97	238,840	53.34	200,640
31	59.89	229,470			52.98	199,090
Change in contents, acre-feet		+19,220		+9,370		-39,750
Change in contents, equivalent mean second-feet		+313		+157		-646

\* Add 2,200 feet to obtain elevation above mean sea level.

## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

## Kachess River near Easton, Wash.

Location.- Lat. 47°15'30", long. 121°11'50", in sec. 3, T. 20 N., R. 13 E., three-quarters of a mile downstream from Kachess Lake and 2 miles northwest of Easton.  
Drainage area.- 64 square miles.

Gage-height record.-Water-stage recorder graph.

Discharge record.— Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge, 2,530 second-feet 8 p.m. May 28 (gage height, 7.12 feet).

1903 to April 1948: Discharge, 2,240 second-feet (computed from gate opening at Kachess Lake) Aug. 27, 1920.

Remarks.— No diversion. Flow regulated by Kachess Lake. Figures of discharge not adjusted for change in contents. Records collected in cooperation with Bureau of Reclamation, who furnish some discharge measurements.

Mean discharge, in second-feet, 1948

mean discharges, in second-feet, 1940												
Day	May	June	July	Day	May	June	July	Day	May	June	July	
1	302	1,203	642	11	500	1,240	845	21	371	665	868	
2	296	1,090	642	12	500	1,240	845	22	117	665	845	
3	308	1,090	915	13	520	990	845	23	99	665	890	
4	323	1,110	1,040	14	520	853	868	24	370	665	890	
5	353	1,150	990	15	520	729	940	25	732	665	890	
6	395	1,140	965	16	520	665	940	26	927	665	890	
7	448	1,160	940	17	537	665	940	27	1,060	665	890	
8	468	1,190	915	18	557	665	915	28	1,780	665	890	
9	500	1,220	890	19	585	665	890	29	2,480	642	890	
10	500	1,220	868	20	627	665	890	30	2,060	642	890	
								31	1,550		890	
Monthly mean discharge, in second-feet .....										672	884	885
Runoff, in inches .....										12.11	15.41	15.95

*Gage height, in feet, and discharge, in second-feet, at indicated time, 1948*

Hour	Gage height		Discharge		Gage height		Discharge		Gage height		Discharge		Gage height		Discharge		
	May 17		May 18		May 19		May 20		May 21		May 22		May 23		May 24		
4									4.13	678	2.52	125					
8									4.19	706	2.53	127					
N	3.79	536	3.84	556	3.90	580	4.00	620	2.52	125	2.54	130					
4									2.52	125	2.54	130					
8									2.52	125	2.39	95					
12	3.82	548	3.87	568	3.96	604	4.10	665	2.52	125	2.39	95					
		May 23		May 24		May 25		May 26		May 27		May 28					
4	2.39	95	2.42	102			4.32	764	4.32	1,050	4.94	1,060					
8	2.40	97	2.43	104					4.34	1,080							
N	2.42	102	3.47	409	4.25	732	4.86	1,020	4.96	1,070	6.30	1,850					
4	2.42	102					4.90	1,040	4.98	1,080	6.92	2,350					
8	2.42	102	4.22	719			4.90	1,040	5.00	1,090	7.12	2,530					
12	2.42	102	4.20	710	4.30	755	4.90	1,040	4.90	1,040	7.10	2,510					
		May 29		May 30		May 31		June 1		June 2		June 3					
4	7.10	2,510	7.00	2,420	6.14	1,740	5.52	1,350			4.98	1,080					
8	7.10	2,510	6.98	2,400	6.12	1,720	5.52	1,350			4.97	1,080					
N	7.05	2,460			5.81	1,530			5.00	1,090	5.00	1,090					
4	7.04	2,460	6.44	1,950	5.80	1,520			5.01	1,100	5.02	1,100					
8	7.05	2,460	6.17	1,760	5.52	1,350	4.98	1,080	5.02	1,100	5.02	1,100					
12	7.04	2,460	6.17	1,760	5.54	1,360	4.98	1,080	4.98	1,080	5.02	1,100					
		June 4		June 5		June 6		June 7		June 8		June 9					
4	5.03	1,100	5.07	1,120													
8	5.04	1,110	5.07	1,120													
N	5.04	1,110	5.08	1,130	5.11	1,140	5.15	1,160	5.20	1,190	5.25	1,220					
4	5.05	1,120	5.08	1,130													
8	5.05	1,120	5.09	1,140													
12	5.06	1,120	5.10	1,140	5.13	1,160	5.18	1,180	5.22	1,200	5.25	1,220					
		June 10		June 11		June 12		June 13		June 14		June 15					
4							5.28	1,230			4.48	836					
8											4.48	836					
N	5.26	1,220	5.30	1,240	5.29	1,240	4.47	832	4.47	832	4.12	674					
4											4.10	665					
8											4.10	665					
12	5.28	1,230	5.30	1,240	5.28	1,230	4.47	832	4.48	836	4.10	665					
		June 16		June 17		June 18		June 19		June 20		June 21					
4																	
8																	
N	4.10	665	4.10	665	4.10	665	4.10	665	4.10	665	4.10	665	4.10	665			
4																	
8																	
12	4.10	665	4.10	665	4.10	665	4.10	665	4.10	665	4.10	665	4.10	665			

## Kachess River near Easton, Wash.--Continued

Supplemental records

May 21, 10 a.m., 4.19 ft., 706 sec.-ft.; 11 a.m., 2.52 ft., 125 sec.-ft.  
22, 5 p.m., 2.39 ft., 95 sec.-ft.  
24, 10 a.m., 2.43 ft., 104 sec.-ft.; 11 a.m., 3.40 ft., 382 sec.-ft.; 3 p.m.,  
3.47 ft., 409 sec.-ft.; 6 p.m., 4.22 ft., 719 sec.-ft.  
26, 9 a.m., 4.34 ft., 773 sec.-ft.; 10 a.m., 4.84 ft., 1,010 sec.-ft.  
28, 9 a.m., 4.98 ft., 1,080 sec.-ft.; 2 p.m., 6.88 ft., 2,310 sec.-ft.  
30, 9 a.m., 4.98 ft., 1,080 sec.-ft.; 2 p.m., 6.88 ft., 2,310 sec.-ft.  
30, 9 a.m., 6.43 ft., 1,940 sec.-ft.; 2 p.m., 6.44 ft., 1,950 sec.-ft.;  
5 p.m., 6.17 ft., 1,760 sec.-ft.  
31, 9 a.m., 5.82 ft., 1,530 sec.-ft.; 5 p.m., 5.51 ft., 1,350 sec.-ft.  
June 1, 10 a.m., 5.52 ft., 1,350 sec.-ft.; 11 a.m., 5.00 ft., 1,090 sec.-ft.;  
1 p.m., 5.00 ft., 1,090 sec.-ft.; 2 p.m., 4.98 ft., 1,080 sec.-ft.  
13, 9 a.m., 5.28 ft., 1,230 sec.-ft.; 10 a.m., 4.47 ft., 832 sec.-ft.  
15, 9 a.m., 4.15 ft., 688 sec.-ft.



## Cle Elum Lake near Roslyn, Wash.

Location.- Lat. 47°15', long. 121°04', at dam on Cle Elum River, in NE $\frac{1}{4}$  sec. 10, T. 20 N., R. 14 E., at outlet of Cle Elum Lake, 4 miles northeast of Roslyn. Datum of gage is at mean sea level (Bureau of Reclamation bench mark).

Drainage area.- 202 square miles.

Gage-height record.- Twice-daily staff-gage readings.

Remarks.- Reservoir is formed on natural lake by earth- and gravel-fill dam. Capacity, 436,000 acre-feet between gate sill (elevation, 2,110.00 feet) and top of spillway gate (elevation, 2,240.00 feet). Records given herein represent usable contents. Records furnished by Bureau of Reclamation, reviewed and prepared for publication by Geological Survey.

Mean elevation\*, in feet, and contents, in acre-feet, 1948

Day	May		June		July	
	Feet	Acre-feet	Feet	Acre-feet	Feet	Acre-feet
1	19.95	345,100	39.15	432,870	40.50	439,360
2	20.25	346,410	39.38	433,970	40.36	438,680
3	20.59	347,890	39.81	436,040	39.96	436,760
4	21.09	350,080	40.08	437,330	39.23	433,250
5	21.64	352,500	40.24	438,100	38.43	429,420
6	22.30	355,400	40.23	438,060	37.76	426,220
7	23.24	359,550	40.16	437,720	37.42	424,680
8	24.11	363,410	40.23	438,060	37.04	422,790
9	24.90	366,920	40.22	438,010	36.63	420,850
10	25.50	369,600	40.10	437,430	36.16	418,620
11	26.02	371,930	40.17	437,770	35.71	416,500
12	26.49	374,040	40.20	437,910	35.18	414,010
13	27.00	376,330	39.99	436,900	34.64	411,480
14	27.46	378,400	39.90	436,470	34.14	409,140
15	27.78	379,850	39.87	436,320	33.61	406,660
16	28.08	381,200	40.11	437,480	33.00	403,820
17	28.57	383,430	40.34	438,590	32.49	401,450
18	28.97	385,250	40.27	438,250	32.05	399,410
19	29.39	387,170	40.13	437,570	31.60	397,330
20	29.96	389,780	40.01	437,000	31.03	394,700
21	30.95	394,330	40.08	437,330	30.46	392,080
22	32.77	402,750	40.17	437,770	29.92	389,600
23	34.56	411,100	40.16	437,720	29.32	386,850
24	36.26	419,100	40.05	437,190	28.65	383,790
25	37.76	426,220	39.96	436,760	27.80	379,940
26	38.33	428,940	40.04	437,140	27.06	376,600
27	39.10	432,630	40.10	437,430	26.31	373,230
28	40.24	438,100	40.17	437,770	25.38	369,060
29	39.94	436,660	40.32	438,490	24.66	365,850
30	39.35	433,820	40.46	439,160	23.81	362,080
31	39.10	432,630			22.97	358,360
Change in contents, acre-feet		+88,790		+6,530		-80,800
Change in contents, equivalent mean second-feet		+1,444		+110		-1,314

\* Add 2,200 feet to obtain elevation above mean sea level.

## Cle Elum River near Roslyn, Wash.

**Location.**- Lat. 47°14'00", long. 121°03'30", in SW $\frac{1}{4}$  sec. 11, T. 20 N., R. 14 E., 1,000 feet downstream from dam at Cle Elum Lake and 4 miles northwest of Roslyn.

**Drainage area.**- 202 square miles.

**Gage-height record.**- Water-stage recorder graph, except for period May 1 to May 9, when gage-heights were computed on basis of interpolation and one observation.

**Discharge record.**- Stage-discharge relationship defined by current-meter measurements below 6,380 second-feet and extended to peak stage. Gage heights used to hundredths May 17 to June 21; to half-tenths between 6.1 and 8.4 feet, hundredths below and tenths above these limits May 1-17, June 22 to July 31. Shifting-control method used May 28.

**Maxima.**- May-June 1948: Discharge, 11,000 second-feet 8 to 9 p.m. May 28 (gage height, 14.00 feet).

1903 to April 1948: Maximum discharge, 18,700 second-feet Nov. 15, 1906 (gage height, 14.05 feet).

**Remarks.**- Flow partly regulated by Cle Elum Lake. Figures of discharge not adjusted for change in contents of Cle Elum Lake. Records collected and prepared in cooperation with Bureau of Reclamation.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2.3	4,380	2,140	11	474	5,440	2,190	21	1,140	2,840	2,240
2	2.3	4,290	2,100	12	580	5,390	2,190	22	296	2,870	2,240
3	2.3	4,510	3,090	13	722	4,440	2,190	23	315	2,770	2,370
4	2.3	4,750	3,200	14	850	3,600	2,190	24	844	2,670	2,420
5	2.3	5,290	3,200	15	920	2,820	2,190	25	3,400	2,240	2,420
6	2.3	6,140	2,560	16	1,010	2,610	2,240	26	5,480	2,060	2,420
7	2.3	6,320	2,140	17	1,150	3,150	2,190	27	5,980	2,060	2,470
8	45	6,360	2,140	18	1,240	3,260	2,190	28	9,090	2,060	2,470
9	202	6,380	2,140	19	1,420	3,230	2,190	29	9,490	2,100	2,470
10	356	5,880	2,190	20	1,640	2,950	2,190	30	5,800	2,140	2,470
								31	4,650		2,520
Monthly mean discharge, in second-feet .....									1,841	3,833	2,366
Runoff, in inches .....									10.51	21.17	13.51

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
May 17		May 18		May 19		May 20		May 21		May 22		
4	6.58	1,070	6.80	1,220	6.94	1,320	7.32	1,580	7.55	1,760	5.08	292
8	6.60	1,080	6.83	1,240	6.96	1,330	7.36	1,610	7.58	1,780	5.08	292
N	6.61	1,090	6.78	1,210	6.99	1,350	7.40	1,640	7.62	1,820	5.09	296
4	6.74	1,180	6.86	1,260	7.22	1,510	7.43	1,660	5.32	388	5.09	296
8	6.77	1,200	6.88	1,280	7.26	1,540	7.47	1,700	5.09	296	5.10	300
12	6.79	1,210	6.92	1,300	7.28	1,560	7.51	1,730	5.08	292	5.11	300
May 23		May 24		May 25		May 26		May 27		May 28		
4	5.12	308	5.17	328					11.08	5,590	12.05	7,080
8	5.13	312							11.10	5,620	12.11	7,280
N	5.13	312			8.78	2,850	11.00	5,480	11.14	5,680		
4	5.15	320	6.12	782	10.42	4,730			11.17	5,720	13.46	9,820
8	5.16	324			10.93	5,390			11.98	6,880	14.00	11,000
12	5.16	324	7.45	1,680	10.94	5,400	11.06	5,560	12.03	6,960	13.97	10,900
May 29		May 30		May 31		June 1		June 2		June 3		
4	13.92	10,800	11.43	6,480	10.50	5,110	10.00	4,430	9.88	4,270	9.92	4,330
8	13.88	10,800	11.39	6,420	10.50	5,110	10.00	4,430	9.88	4,270	10.08	4,530
N	13.81	10,600	10.74	5,450	9.92	4,350	9.99	4,420	9.89	4,290	10.11	4,570
4	13.20	9,490	10.72	5,420	10.00	4,430	9.99	4,420	9.90	4,300		
8	11.76	7,010	10.55	5,180					9.90	4,300	10.15	4,620
12	11.47	6,540	10.52	5,140	10.00	4,430	3.87	4,260	9.91	4,310	10.16	4,640
June 4		June 5		June 6		June 7		June 8		June 9		
4	10.17	4,650	10.36	4,910	10.90	5,680						
8	10.17	4,650	10.49	5,100	11.32	6,310						
N	10.17	4,650	10.69	5,380	11.33	6,320	11.33	6,320	11.35	6,360	11.37	6,380
4	10.32	4,860	10.87	5,640	11.33	6,320						
8	10.33	4,870	10.88	5,650	11.33	6,320						
12	10.34	4,890	10.90	5,680	11.33	6,320	11.34	6,340	11.37	6,380	11.35	6,360
June 10		June 11		June 12		June 13		June 14		June 15		
4	11.35	6,360			10.71	5,400	10.43	5,010	9.65	3,980	9.13	3,350
8	11.26	6,220			10.70	5,390	10.08	4,530	9.35	3,610	8.70	2,870
N	11.25	6,200	10.73	5,430	10.70	5,390	10.06	4,510	9.33	3,590	8.67	2,840
4	10.73	5,430			10.69	5,380	9.69	4,030	9.17	3,390	8.27	2,440
8	10.72	5,420			10.68	5,360	9.66	3,990	9.14	3,360	8.24	2,410
12	10.72	5,420	10.75	5,460	10.47	5,070	9.66	3,990	9.14	3,360	8.23	2,400
June 16		June 17		June 18		June 19		June 20		June 21		
4	8.22	2,390	8.65	2,820	9.07	3,280			9.02	3,220		
8	8.21	2,380	9.04	3,240	9.06	3,270			8.69	2,860		
N	8.59	2,760	9.06	3,270	9.05	3,260	9.03	3,230	8.68	2,850	8.67	2,840
4	8.62	2,790	9.07	3,280	9.04	3,240			8.67	2,840		
8	8.63	2,800	9.07	3,280	9.03	3,230			8.67	2,840		
12	8.64	2,810	9.07	3,280	9.03	3,230	9.02	3,220	8.67	2,840	8.67	2,840

## Cle Elum River near Roslyn, Wash.--Continued

Supplemental record:

May 19, 1 p.m., 7.19 ft., 1,490 sec.-ft.  
 21, 1 p.m., 6.30 ft., 890 sec.-ft.; 3 p.m., 6.09 ft., 764 sec.-ft.;  
     5 p.m., 5.14 ft., 316 sec.-ft.  
 24, 10 a.m., 5.18 ft., 332 sec.-ft.; 11 a.m., 6.04 ft., 734 sec.-ft.;  
     5 p.m., 7.27 ft., 1,550 sec.-ft.; 6 p.m., 7.37 ft., 1,620 sec.-ft.  
 25, 7 a.m., 7.47 ft., 1,700 sec.-ft.; 9 a.m., 7.48 ft., 1,700 sec.-ft.;  
     10 a.m., 8.02 ft., 2,140 sec.-ft.; 11 a.m., 8.72 ft., 2,790 sec.-ft.;  
     2 p.m., 10.34 ft., 4,620 sec.-ft.; 5 p.m., 10.64 ft., 5,010 sec.-ft.;  
     6 p.m., 10.90 ft., 5,350 sec.-ft.  
 27, 5 p.m., 11.48 ft., 6,150 sec.-ft.; 6 p.m., 11.70 ft., 6,460 sec.-ft.;  
     7 p.m., 11.91 ft., 6,780 sec.-ft.  
 28, 9 a.m., 12.77 ft., 8,370 sec.-ft.; 10 a.m., 13.32 ft., 9,340 sec.-ft.;  
     11 a.m., 13.44 ft., 9,600 sec.-ft.; 5 p.m., 13.80 ft., 10,500 sec.-ft.;  
     6 p.m., 14.00 ft., 10,900 sec.-ft.; 9 p.m., 14.00 ft., 11,000 sec.-ft.  
 29, 1 p.m., 13.58 ft., 10,200 sec.-ft.; 2 p.m., 13.26 ft., 9,600 sec.-ft.;  
     5 p.m., 12.60 ft., 8,410 sec.-ft.; 6 p.m., 12.08 ft., 7,530 sec.-ft.;  
     7 p.m., 11.85 ft., 7,150 sec.-ft.; 11 p.m., 11.71 ft., 6,930 sec.-ft.  
 30, 9 a.m., 11.39 ft., 6,420 sec.-ft.; 10 a.m., 10.79 ft., 5,520 sec.-ft.;  
     7 p.m., 10.71 ft., 5,400 sec.-ft.  
 31, 9 a.m., 10.00 ft., 4,430 sec.-ft.; 3 p.m., 9.91 ft., 4,310 sec.-ft.  
 June 1, 10 a.m., 10.00 ft., 4,430 sec.-ft.; 5 p.m., 9.89 ft., 4,290 sec.-ft.;  
     6 p.m., 9.87 ft., 4,260 sec.-ft.  
     3, 7 a.m., 9.93 ft., 4,340 sec.-ft.; 3 p.m., 10.13 ft., 4,600 sec.-ft.  
     4, 3 p.m., 10.18 ft., 4,660 sec.-ft.  
     5, 7 a.m., 10.36 ft., 4,910 sec.-ft.; 9 a.m., 10.50 ft., 5,110 sec.-ft.;  
     11 a.m., 10.50 ft., 5,110 sec.-ft.; 2 p.m., 10.70 ft., 5,390 sec.-ft.;  
     3 p.m., 10.82 ft., 5,560 sec.-ft.  
     6, 6 a.m., 10.90 ft., 5,680 sec.-ft.; 7 a.m., 11.30 ft., 6,280 sec.-ft.  
 10, 7 a.m., 11.35 ft., 6,360 sec.-ft.; 1 p.m., 10.76 ft., 5,470 sec.-ft.;  
     2 p.m., 10.74 ft., 5,450 sec.-ft.  
     12, 3 a.m., 10.76 ft., 5,470 sec.-ft.; 11 p.m., 10.67 ft., 5,350 sec.-ft.  
     13, 6 a.m., 10.42 ft., 5,000 sec.-ft.; 7 a.m., 10.11 ft., 4,570 sec.-ft.;  
     1 p.m., 9.86 ft., 4,250 sec.-ft.; 3 p.m., 9.84 ft., 4,220 sec.-ft.;  
     5 p.m., 9.67 ft., 4,000 sec.-ft.  
     14, 6 a.m., 9.65 ft., 3,980 sec.-ft.; 7 a.m., 9.38 ft., 3,650 sec.-ft.;  
     1 p.m., 9.20 ft., 3,430 sec.-ft.  
     15, 6 a.m., 9.13 ft., 3,350 sec.-ft.; 7 a.m., 8.78 ft., 2,960 sec.-ft.;  
     2 p.m., 8.67 ft., 2,840 sec.-ft.; 3 p.m., 8.31 ft., 2,480 sec.-ft.  
     16, 10 a.m., 8.21 ft., 2,380 sec.-ft.; 11 a.m., 8.55 ft., 2,720 sec.-ft.  
     17, 6 a.m., 8.66 ft., 2,830 sec.-ft.; 7 a.m., 9.00 ft., 3,200 sec.-ft.  
     20, 6 a.m., 9.02 ft., 3,220 sec.-ft.; 7 a.m., 8.73 ft., 2,900 sec.-ft.

## Teanaway River near Cle Elum, Wash.

Location.- Lat. 47°12', long. 120°47', in SW $\frac{1}{4}$  sec. 25, T. 20 N., R. 16 E., 4 miles upstream from mouth and  $\frac{7}{8}$  miles east of Cle Elum.

Drainage area.- 205 square miles.

Gage-height record.- Water-stage recorder graph prior to 2 p.m. May 27, once-daily staff-gage readings thereafter, except for periods 2 p.m. May 27 to May 30, July 25-30, when there was no gage-height record.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 2,240 second-feet and extended to peak stage. Gage heights used to hundredths. Shifting-control method used May 29, 30. Discharge for periods of no gage-height record computed on basis of interpolated gage heights or gage-height graph based on floodmarks and records for Chiwawa River near Plain.

Maxima.- May-June 1948: Discharge, 4,170 second-feet about 10 p.m. May 28 (gage height, 35.57 feet, from floodmarks).

1909-14, 1946 to April 1948: Discharge, 4,030 second-feet Mar. 20, 1910 (gage height, 7.20 feet, site and datum then in use).

Remarks.- Small diversions in Teanaway Valley for irrigation. No regulation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	502	1,830	258	11	1,070	1,370	163	21	2,320	709	69
2	535	1,830	258	12	1,090	1,240	163	22	2,490	572	69
3	725	1,830	192	13	1,150	1,110	135	23	2,160	516	42
4	1,020	1,670	192	14	1,060	885	135	24	2,250	466	34
5	962	1,520	163	15	1,030	709	135	25	2,310	466	33
6	1,380	1,520	224	16	1,150	709	110	26	2,400	419	32
7	1,750	1,520	192	17	1,220	1,110	110	27	2,710	374	30
8	1,560	1,520	192	18	1,200	885	110	28	3,100	374	30
9	1,210	1,370	192	19	1,230	792	88	29	3,340	332	28
10	1,100	1,240	163	20	2,240	792	88	30	2,210	332	28
								31	1,850		25
Monthly mean discharge, in second-feet .....									1,617	1,000	119
Runoff, in inches .....									9.09	5.44	0.67

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	34.17	1,240	34.17	1,240	34.15	1,220	34.71	1,950	35.03	2,600	35.07	2,700
8	34.17	1,240	34.15	1,220	34.13	1,200	34.86	2,230	34.94	2,400	35.02	2,580
N	34.15	1,220	34.12	1,190	34.11	1,180	34.87	2,250	34.83	2,170	34.95	2,420
4	34.13	1,200	34.09	1,160	34.10	1,170	34.90	2,310	34.74	2,000	34.88	2,270
8	34.15	1,220	34.12	1,190	34.19	1,260	35.03	2,600	34.84	2,190	34.96	2,440
12	34.17	1,240	34.15	1,220	34.40	1,490	35.06	2,670	34.98	2,490	35.02	2,580
	May 23		May 24		May 25		May 26		May 27		May 28	
4	34.95	2,420	34.90	2,310	34.92	2,350	34.97	2,460	35.18	2,980	34.96	2,440
8	34.87	2,250	34.90	2,310	34.87	2,250	34.92	2,350	35.26	3,200	35.04	2,630
N	34.78	2,070	34.83	2,170	34.84	2,190	34.87	2,250	35.14	2,870	35.17	2,950
4	34.72	1,970	34.82	2,150	34.84	2,190	34.85	2,170	34.95	2,380	35.32	3,370
8	34.70	1,950	34.89	2,290	34.96	2,440	34.89	2,510	34.90	2,310	35.50	3,930
12	34.80	2,110	34.95	2,420	34.99	2,510	35.09	2,750	34.91	2,330	35.56	4,130
	May 29		May 30		May 31		June 1		June 2		June 3	
4	35.47	3,830	35.41	2,440	35.18	1,920						
8	35.48	3,520	35.38	2,230	35.15	1,870						
N	35.48	3,310	35.33	2,170	35.13	1,830						
4	35.47	3,090	35.28	2,090	35.12	1,820						
8	35.46	2,870	35.24	2,020	35.11	1,800						
12	35.44	2,670	35.20	1,950	35.09	1,770						

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
8:10a	June 1	35.13	1,830	11a	June 6	34.93	1,520	7:25a	June 12	34.73	1,240
7:50a	June 2	35.13	1,830	7:40a	June 7	34.93	1,520	8a	June 13	34.63	1,110
6:40a	June 3	35.13	1,830	8:10a	June 8	34.93	1,520	7:45a	June 14	34.43	885
8:15a	June 4	35.03	1,670	7:45a	June 9	34.83	1,370	7:45a	June 15	34.23	709
8:10a	June 5	34.93	1,520	8a	June 10	34.73	1,240	7:15a	June 16	34.23	709
8:45a	June 6	34.93	1,520	8:10a	June 11	34.83	1,370	7:05a	June 17	34.63	1,110

Supplemental record.- May 28, 10 p.m., 35.57 ft., 4,170 sec.-ft.

## Naches River below Tieton River, near Naches, Wash.

Location.- Lat. 46°44'40", long. 120°46'00", in SW¼ sec. 36, T. 15 N., R. 16 E., half a mile downstream from Wapatox power canal, three-quarters of a mile downstream from Tieton River, and 3½ miles northwest of Naches. Datum of gage is 1,550 feet above mean sea level (U. S. Coast and Geodetic Survey datum, as adjusted in 1929).

Drainage area.- 943 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 10,800 second-feet and extended to peak stage. Gage heights used to hundredths May 17 to June 21; half-tenths above and hundredths below 12.4 feet May 1-16, June 22 to July 31.

Maxima.- May-June 1948: Discharge, 12,600 second-feet 4 p.m. May 28 (gage height, 17.58 feet).

1905, 1908-12, 1915 to April 1948: Discharge, 32,200 second-feet Dec. 22, 23, 1933 (gage height, 14.33 feet, site and datum then in use).

Remarks.- Flow regulated by Bumping Lake and Tieton Reservoir, and by diversion of Selah Valley, Tieton, and Wapatox Canals (total average diversion: May, 768 second-feet; June, 825 second-feet; July, 957 second-feet). Figures of discharge not adjusted for storage or diversions. Other small diversions above station are small percentage of flood discharge. Records collected and prepared in cooperation with Bureau of Reclamation, who furnish some discharge measurements.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,190	6,890	2,860	11	1,820	9,850	841	21	4,410	4,850	930
2	1,420	6,980	2,420	12	1,880	9,110	990	22	5,080	4,420	900
3	1,700	8,190	2,350	13	2,080	7,380	805	23	5,030	3,950	841
4	1,950	8,630	2,490	14	2,020	6,490	1,270	24	5,350	3,680	814
5	2,020	8,270	2,490	15	1,950	5,500	1,240	25	7,090	3,520	787
6	2,210	8,470	2,420	16	2,020	5,950	1,200	26	8,690	3,540	769
7	2,560	9,000	2,080	17	2,280	6,180	1,180	27	10,100	3,260	760
8	2,210	9,420	1,640	18	2,560	5,430	1,320	28	11,800	3,020	769
9	2,080	9,690	1,160	19	2,630	4,910	1,240	29	10,600	2,720	680
10	1,880	9,160	890	20	3,410	4,850	1,060	30	8,420	3,180	570
								31	7,250		584
Monthly mean discharge, in second-feet									4,055	6,210	1,302
Runoff, in inches									4.96	7.35	1.59

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17	May 18	May 19	May 20	May 21	May 22						
4	12.97	2,170	13.26	2,580	13.27	2,600	13.52	2,970	14.25	4,240	14.63	4,990
8	13.02	2,240	13.27	2,600	13.27	2,600	13.69	3,240	14.33	4,390	14.69	5,120
N	13.05	2,280	13.26	2,580	13.28	2,610	13.85	3,520	14.38	4,480	14.72	5,180
4	13.05	2,280	13.23	2,540	13.29	2,620	13.91	3,620	14.39	4,500	14.69	5,120
8	13.14	2,410	13.22	2,520	13.33	2,680	13.98	3,740	14.40	4,520	14.68	5,100
12	13.22	2,520	13.25	2,560	13.40	2,790	14.12	3,990	14.50	4,720	14.72	5,180
	May 23	May 24	May 25	May 26	May 27	May 28						
4	14.72	5,180	14.67	5,080	15.47	6,890	16.04	8,320	16.51	9,570	16.98	10,900
8	14.70	5,140	14.68	5,100	15.51	6,980	16.10	8,480	16.78	10,300	17.28	11,700
N	14.67	5,080	14.68	5,100	15.54	7,060	16.16	8,640	16.82	10,400	17.48	12,300
4	14.58	4,890	14.79	5,330	15.56	7,110	16.34	9,110	16.76	10,200	17.58	12,600
8	14.55	4,820	14.92	5,610	15.64	7,310	16.43	9,350	16.77	10,300	17.50	12,300
12	14.61	4,950	15.46	6,860	15.74	7,560	16.28	8,950	16.83	10,400	17.39	12,000
	May 29	May 30	May 31	June 1	June 2	June 3						
4	17.23	11,600	16.30	9,000	15.73	7,540	15.53	7,040	15.46	6,860	15.82	7,760
8	17.06	11,100	16.18	8,690	15.68	7,410	15.52	7,010	15.48	6,910	15.89	7,940
N	16.88	10,600	16.11	8,510	15.60	7,210	15.49	6,940	15.48	6,910	15.98	8,170
4	16.71	10,100	15.91	7,990	15.53	7,040	15.42	6,770	15.50	6,960	16.10	8,460
8	16.55	9,680	15.84	7,810	15.50	6,960	15.38	6,670	15.56	7,110	16.17	8,680
12	16.41	9,300	15.79	7,680	15.52	7,010	15.42	6,770	15.69	7,440	16.21	8,770
	June 4	June 5	June 6	June 7	June 8	June 9						
4	16.22	8,790	16.07	8,400	16.07	8,400	16.26	8,900	16.40	9,270	16.58	9,760
8	16.22	8,790	16.03	8,300	16.10	8,480	16.30	9,000	16.42	9,320	16.59	9,780
N	16.18	8,690	16.01	8,250	16.10	8,480	16.32	9,050	16.47	9,460	16.57	9,730
4	16.11	8,510	15.98	8,170	16.09	8,450	16.31	9,030	16.52	9,590	16.58	9,760
8	16.07	8,400	15.98	8,170	16.12	8,530	16.33	9,080	16.48	9,490	16.49	9,510
12	16.08	8,430	16.01	8,250	16.20	8,740	16.36	9,160	16.55	9,680	16.49	9,510
	June 10	June 11	June 12	June 13	June 14	June 15						
4	16.45	9,400	16.37	9,190	16.61	9,840	15.82	7,760	15.38	6,670	15.00	5,790
8	16.38	9,220	16.60	9,810	16.51	9,570	15.75	7,580	15.33	6,550	14.92	5,610
N	16.34	9,110	16.74	10,200	16.37	9,190	15.67	7,380	15.27	6,410	14.86	5,480
4	16.26	8,900	16.76	10,200	16.19	8,710	15.58	7,160	15.37	6,650	14.77	5,290
8	16.31	9,030	16.72	10,100	16.02	8,270	15.50	6,960	15.22	6,300	14.73	5,200
12	16.32	9,050	16.69	10,100	15.94	8,060	15.43	6,790	15.07	5,950	14.81	5,370
	June 16	June 17	June 18	June 19	June 20	June 21						
4	14.96	5,700	15.25	6,360	14.96	5,700	14.66	5,060	14.51	4,740	14.55	4,820
8	15.01	5,810	15.24	6,340	14.90	5,570	14.62	4,970	14.76	5,270	14.60	4,930
N	15.09	6,000	15.22	6,300	14.85	5,460	14.59	4,910	14.55	4,820	14.60	4,930
4	15.15	6,140	15.14	6,110	14.76	5,270	14.57	4,870	14.55	4,820	14.57	4,870
8	15.19	6,230	15.07	5,950	14.70	5,140	14.52	4,760	14.50	4,720	14.54	4,800
12	15.22	6,300	15.00	5,790	14.67	5,080	14.51	4,740	14.51	4,740	14.50	4,720

## Bumping Lake near Nile, Wash.

Location.- Lat. 46°52', long. 121°18', at dam on Bumping River in SW $\frac{1}{4}$  sec. 23 (unsurveyed), T. 16 N., R. 12 E., at outlet of Bumping Lake, 11 $\frac{1}{2}$  miles upstream from American River, and 19 miles west of Nile. Datum of gage is at mean sea level (Bureau of Reclamation bench mark).

Drainage area.- 68 square miles.

Gage-height record.- Staff gage read twice daily.

Remarks.- Reservoir is formed on natural lake by earth-fill dam. Capacity, 33,800 acre-feet between gate sill (elevation, 3,389.00 feet) and spillway crest (elevation, 3,426.00 feet). Records given herein represent usable contents. Water used for irrigation. Records furnished by Bureau of Reclamation, reviewed and prepared for publication by Geological Survey.

Elevation,\* in feet, and contents, in acre-feet, 1948

Day	May		June		July	
	Feet	Acre-feet	Feet	Acre-feet	Feet	Acre-feet
1	5.92	11,940	27.88	36,200	27.44	35,610
2	6.02	12,030	27.99	36,340	27.41	35,570
3	6.15	12,140	28.11	36,500	27.37	35,510
4	6.23	12,210	28.19	36,610	27.28	35,390
5	6.28	12,250	28.16	36,570	27.18	35,260
6	6.29	12,260	28.24	36,680	27.08	35,130
7	6.50	12,440	28.41	36,910	27.03	35,060
8	7.07	12,930	28.49	37,020	26.97	34,980
9	7.44	13,260	28.46	36,980	26.93	34,930
10	7.77	13,550	28.39	36,880	26.89	34,880
11	7.95	13,710	28.40	36,900	26.85	34,820
12	8.17	13,910	28.29	36,750	26.83	34,800
13	8.48	14,190	28.03	36,400	26.80	34,760
14	8.69	14,380	27.85	36,160	26.79	34,740
15	8.86	14,540	27.71	35,970	26.78	34,730
16	9.08	14,740	27.69	35,940	26.76	34,700
17	9.33	14,970	27.76	36,030	26.74	34,680
18	9.65	15,270	27.72	35,980	26.78	34,730
19	10.07	15,670	27.66	35,900	26.77	34,720
20	10.55	16,130	27.61	35,830	26.71	34,640
21	11.47	17,030	27.58	35,790	26.62	34,520
22	12.70	18,260	27.50	35,690	26.51	34,370
23	14.08	19,690	27.47	35,650	26.39	34,220
24	15.36	21,050	27.44	35,610	26.28	34,070
25	17.21	23,080	27.42	35,580	26.15	33,900
26	19.52	25,710	27.41	35,570	26.02	33,730
27	22.42	29,180	27.40	35,550	25.79	33,440
28	25.78	33,420	27.41	35,570	25.56	33,140
29	27.63	35,860	27.45	35,620	25.35	32,870
30	27.89	36,210	27.46	35,630	25.12	32,570
31	27.85	36,160			24.89	32,260
Change in contents, acre-feet		+24,290		-530		-3,350
Change in contents, equivalent mean second-feet		+395		-8.9		-54

\* Add 3,400.00 feet to obtain elevation above mean sea level.

## Bumping River near Nile, Wash.

Location.- Lat. 46°52', long. 121°18', a quarter of a mile downstream from spillway of Bumping Lake Dam and 19 miles west of Nile, Yakima County.

Drainage area.- 68 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 1,400 second-feet and extended to peak stage. Gage heights used to hundredths May 17 to June 21; half-tenths above and hundredths below 3.5 feet May 1-16, June 22 to July 31.

Maxima.- May-June 1948: Discharge, 1,860 second-feet 6:45 a.m. June 8 (gage height, 5.35 feet).

1906, 1909 to April 1948: Discharge, 5,180 second-feet Dec. 29, 1917 (gage height, 9.33 feet).

Remarks.- Flow regulated by Bumping Lake. Figures of a discharge not adjusted for change in contents of Bumping Lake. No diversion. Records collected and prepared in cooperation with Bureau of Reclamation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	188	1,300	760	11	313	1,760	363	21	359	982	305
2	188	1,410	640	12	316	1,600	343	22	376	880	281
3	196	1,570	575	13	316	1,380	331	23	393	820	264
4	216	1,560	531	14	320	1,230	316	24	372	790	271
5	274	1,540	470	15	320	1,120	302	25	301	760	288
6	295	1,620	498	16	324	1,140	295	26	318	760	298
7	302	1,750	484	17	328	1,150	295	27	303	760	305
8	305	1,810	430	18	329	1,060	331	28	397	760	305
9	309	1,800	388	19	334	1,000	291	29	1,130	820	305
10	313	1,730	371	20	343	1,000	281	30	1,300	820	305
								31	1,240		305
Monthly mean discharge, in second-feet .....									397	1,223	372
Runoff, in inches .....									6.74	20.06	6.30

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	2.78	328	2.78	328	2.80	335	2.82	343	2.86	359	2.90	375
8												
12	2.78	328	2.79	331	2.80	335	2.84	351	2.88	367	2.93	388
	May 23		May 24		May 25		May 26		May 27		May 28	
4					2.72	305	2.74	313	2.77	324	2.71	302
8					2.69	295	2.75	316	2.71	302	2.72	305
N	2.94	392	2.97	404	2.69	295	2.75	316	2.68	291	2.71	302
4			2.78	328	2.70	298	2.77	324	2.68	291	2.86	359
8			2.78	328	2.72	305	2.78	328	2.69	295	3.42	615
12	2.96	400	2.71	302	2.73	309	2.74	313	2.70	298	3.64	727
	May 29		May 30		May 31		June 1		June 2		June 3	
4	4.00	940	4.61	1,330	4.51	1,260	4.56	1,290	4.69	1,380	4.92	1,540
8	4.26	1,100	4.60	1,320	4.49	1,240	4.57	1,300	4.70	1,390	4.96	1,570
N	4.40	1,180	4.59	1,310	4.47	1,230	4.58	1,310	4.70	1,390	4.97	1,580
4	4.50	1,250	4.55	1,280	4.48	1,240	4.57	1,300	4.72	1,400	4.98	1,590
8	4.56	1,290	4.53	1,270	4.49	1,240	4.60	1,320	4.78	1,450	4.99	1,590
12	4.60	1,320	4.52	1,260	4.52	1,260	4.65	1,360	4.85	1,500	5.00	1,600
	June 4		June 5		June 6		June 7		June 8		June 9	
4	4.99	1,590	4.91	1,540	5.00	1,600	5.20	1,740	5.34	1,850	5.32	1,840
8	4.97	1,580	4.91	1,540	5.01	1,610	5.21	1,750	5.14	1,700	5.27	1,800
N	4.93	1,550	4.88	1,520	5.00	1,600	5.20	1,740	5.21	1,830	5.28	1,800
4	4.90	1,530	4.88	1,520	5.00	1,600	5.21	1,750	5.29	1,810	5.24	1,770
8	4.89	1,520	4.90	1,530	5.06	1,640	5.24	1,770	5.30	1,820	5.25	1,780
12	4.91	1,540	4.97	1,580	5.14	1,700	5.29	1,810	5.32	1,840	5.25	1,780
	June 10		June 11		June 12		June 13		June 14		June 15	
4	5.24	1,770	5.22	1,760	5.14	1,700	4.78	1,450	4.56	1,290	4.35	1,150
8	5.21	1,750	5.23	1,760	5.08	1,680	4.74	1,420	4.50	1,250	4.32	1,130
N	5.15	1,700	5.23	1,760	5.00	1,600	4.69	1,380	4.45	1,220	4.29	1,110
4	5.12	1,680	5.24	1,770	4.91	1,540	4.63	1,340	4.41	1,190	4.23	1,080
8	5.19	1,730	5.23	1,760	4.88	1,520	4.59	1,310	4.39	1,170	4.25	1,090
12	5.20	1,740	5.20	1,740	4.81	1,470	4.58	1,310	4.38	1,170	4.26	1,100
	June 16		June 17		June 18		June 19		June 20		June 21	
4	4.26	1,100	4.41	1,190	4.27	1,100	4.12	1,010	4.10	1,000	4.11	1,010
8	4.30	1,120	4.39	1,170	4.24	1,080	4.12	1,010	4.11	1,010	4.08	994
N	4.34	1,140	4.35	1,150	4.20	1,060	4.12	1,010	4.10	1,000	4.09	988
4	4.38	1,170	4.31	1,130	4.15	1,030	4.09	994	4.09	994	4.06	976
8	4.40	1,180	4.29	1,113	4.13	1,020	4.07	982	4.10	1,000	4.02	952
12	4.39	1,170	4.28	1,110	4.13	1,020	4.08	988	4.17	1,000	4.00	940

Supplemental record.- May 24, 2 p.m., 2.97 ft., 404 sec.-ft.; May 27, 7 a.m., 2.78 ft., 328 sec.-ft.; May 28, 2 p.m., 2.71 ft., 302 sec.-ft.

## American River near Nile, Wash.

Location.- Lat. 46°58'30", long. 121°10'10", in SW $\frac{1}{4}$  sec. 12, T. 17 N., R. 13 E., 300 feet upstream from Bumping Lake road crossing, three-quarters of a mile upstream from mouth, and 16 miles northwest of Nile. Datum of gage is 2,700.0 feet above mean sea level (Washington State Highway Department bench mark).

Drainage area.- 79 square miles.

Gage-height record.- Water-stage recorder graph except for period 5 a.m. May 27 to 12 p.m. May 28, for which graph was drawn based on floodmark.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Gage heights used to hundredths May 1 to June 21; half-tenths between 73.90 and 75.90, hundredths below and tenths above these limits June 22 to July 31. Shifting-control method used May 27.

Maxima.- May-June 1948: Discharge, 2,600 second-feet about 10 p.m. May 27 (gage height, 76.60 feet, from floodmark in well).

1909-11, 1913-15, 1939 to April 1948: Discharge observed, 1,580 second-feet June 2, 1909 (gage height, 4.55 feet, datum then in use).

Remarks.- No diversion or regulation. Records collected in cooperation with Bureau of Reclamation, who furnish some discharge measurements.

## Mean discharge, in second-feet, 1948

mean discharge, in second-feet, 1940											
Day	May	June	July	Day	May	June	July	Day	May	June	July
1	226	1,180	602	11	398	1,610	313	21	888	740	219
2	220	1,260	490	12	421	1,380	284	22	1,120	662	202
3	240	1,430	441	13	458	1,050	277	23	1,150	624	193
4	261	1,430	414	14	437	951	270	24	1,240	602	177
5	268	1,360	379	15	425	843	270	25	1,480	580	164
6	368	1,430	388	16	454	838	250	26	1,710	575	154
7	522	1,540	375	17	506	836	250	27	2,330	596	151
8	488	1,610	345	18	524	732	280	28	2,420	673	146
9	437	1,550	309	19	536	702	250	29	1,830	690	134
10	413	1,490	309	20	657	750	228	30	1,330	695	128
								31	1,140		122
Monthly mean discharge, in second-feet.....									803	1,014	275
Runoff, in inches .....									11.72	14.32	4.01

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	73.76	492	73.84	527	73.85	532	73.99	596	74.44	836	74.83	1,080
8	73.79	505	73.84	527	73.85	532	74.03	616	74.48	859	74.90	1,130
N	73.80	509	73.83	522	73.85	532	74.08	641	74.49	865	74.89	1,120
4	73.81	514	73.82	518	73.85	532	74.15	677	74.55	900	74.90	1,130
8	73.82	519	73.83	522	73.87	540	74.25	730	74.65	960	74.93	1,150
12	73.83	522	73.85	532	73.93	568	74.36	791	74.76	1,030	74.96	1,170
	May 23		May 24		May 25		May 26		May 27		May 28	
4	74.99	1,190	75.02	1,210	75.30	1,420	75.67	1,720	76.06	2,060	76.55	2,560
8	74.94	1,160	75.03	1,220	75.36	1,470	75.67	1,720	76.25	2,230	76.49	2,510
N	74.90	1,130	75.02	1,210	75.39	1,490	75.64	1,690	76.41	2,390	76.41	2,450
4	74.87	1,110	75.02	1,210	75.39	1,480	75.60	1,660	76.52	2,500	76.30	2,360
8	74.92	1,140	75.13	1,290	75.43	1,520	75.70	1,740	76.58	2,570	76.19	2,270
12	75.00	1,200	75.24	1,370	75.55	1,620	75.86	1,870	76.58	2,580	76.06	2,170
	May 29		May 30		May 31		June 1		June 2		June 3	
4	75.92	2,060	75.10	1,450	74.71	1,180	74.72	1,180	74.83	1,260	74.96	1,350
8	75.79	1,950	75.01	1,390	74.69	1,160	74.73	1,190	74.87	1,290	75.07	1,430
N	75.67	1,860	74.90	1,310	74.65	1,140	74.72	1,180	74.90	1,310	75.10	1,450
4	75.42	1,670	74.81	1,250	74.59	1,100	74.69	1,150	74.78	1,230	75.13	1,470
8	75.32	1,600	74.76	1,210	74.61	1,110	74.70	1,170	74.80	1,240	75.15	1,480
12	75.21	1,530	74.72	1,180	74.67	1,150	74.76	1,210	74.86	1,280	75.17	1,500
	June 4		June 5		June 6		June 7		June 8		June 9	
4	75.17	1,500	75.01	1,390	75.08	1,440	75.23	1,540	75.32	1,600	75.32	1,600
8	75.13	1,470	75.03	1,400	75.12	1,460	75.29	1,580	75.38	1,650	75.31	1,600
N	75.08	1,440	75.01	1,390	75.09	1,440	75.29	1,580	75.40	1,660	75.26	1,560
4	75.00	1,380	74.93	1,330	75.02	1,390	75.23	1,540	75.31	1,600	75.19	1,510
8	74.95	1,340	74.90	1,310	75.05	1,420	75.19	1,510	75.28	1,580	75.17	1,500
12	74.96	1,350	74.99	1,370	75.11	1,460	75.26	1,560	75.27	1,570	75.18	1,510
	June 10		June 11		June 12		June 13		June 14		June 15	
4	75.22	1,530	75.24	1,550	75.26	1,560	74.60	1,100	74.42	997	74.22	877
8	75.22	1,530	75.34	1,620	75.15	1,480	74.56	1,080	74.40	985	74.21	871
N	75.18	1,510	75.39	1,650	75.00	1,380	74.51	1,050	74.35	955	74.18	853
4	75.09	1,440	75.38	1,650	74.89	1,300	74.46	1,020	74.31	931	74.12	817
8	75.07	1,430	75.37	1,640	74.73	1,190	74.42	997	74.26	901	74.08	794
12	75.09	1,440	75.35	1,620	74.63	1,120	74.41	991	74.23	883	74.10	805
	June 16		June 17		June 18		June 19		June 20		June 21	
4	74.11	811	74.22	877	74.02	761	73.92	706	74.01	756	74.03	766
8	74.13	823	74.21	871	74.01	756	73.94	717	74.03	766	74.03	766
N	74.16	841	74.18	853	73.98	739	73.91	700	74.01	756	74.00	750
4	74.18	853	74.11	811	73.93	712	73.89	690	73.99	744	73.96	728
8	74.19	859	74.06	783	73.90	695	73.89	690	73.98	739	73.92	706
12	74.21	871	74.03	766	73.90	695	73.94	717	74.01	756	73.90	695

Supplemental record.- May 27, 10 p.m., 76.60 ft., 2,600 sec.-ft.; June 7, 10 a.m., 75.31 ft., 1,600 sec.-ft.



## Tieton Reservoir near Naches, Wash.

Location.- Lat. 46°39', long. 121°07', in SW $\frac{1}{4}$  sec. 31 (unsurveyed), T. 14 N., R. 14 E., on face of dam on Tieton River, at spillway, 2,000 feet upstream from Wildcat Creek, at Rimrock, 7 $\frac{1}{2}$  miles upstream from headworks of Tieton Canal, and 22 $\frac{1}{2}$  miles southwest of Naches. Datum of gage is at mean sea level (Bureau of Reclamation bench mark).

Drainage area.- 187 square miles.

Gage-height record.- Staff-gage read twice daily.

Remarks.- Reservoir is formed by earth- and gravel-fill dam. Capacity, 197,000 acre-feet between sill of tunnel entrance (elevation, 2,768.00 feet) and crest of spillway gates (elevation, 2,926.00 feet). Records given herein represent usable contents. Water used for irrigation. Records furnished by Bureau of Reclamation, reviewed and prepared for publication by Geological Survey.

Elevation,\* in feet, and contents, in acre-feet, 1948

Day	May		June		July	
	Feet	Acre-feet	Feet	Acre-feet	Feet	Acre-feet
1	8.37	156,650	25.64	197,090	26.82	200,080
2	8.13	156,120	26.24	198,600	28.71	199,800
3	7.71	155,210	26.59	199,490	28.58	199,460
4	7.24	154,190	26.94	200,130	28.18	198,450
5	6.76	153,150	26.81	200,050	25.62	197,040
6	6.64	152,890	26.85	200,150	25.10	195,730
7	6.99	153,650	26.94	200,380	24.80	194,980
8	7.71	155,210	27.05	200,660	24.66	194,630
9	8.35	156,600	27.10	200,790	24.73	194,810
10	8.96	157,940	27.13	200,850	24.94	195,330
11	9.49	159,100	27.24	201,150	25.22	196,030
12	10.03	160,290	27.15	200,920	25.37	196,410
13	10.62	161,600	26.91	200,300	25.40	196,480
14	11.17	162,820	26.75	199,900	25.20	195,980
15	11.71	164,050	26.62	199,570	24.88	195,180
16	12.25	165,240	26.74	199,870	24.57	194,410
17	12.78	166,440	26.80	200,020	24.28	193,690
18	13.18	167,340	26.66	199,670	24.06	193,140
19	13.56	169,210	26.56	199,410	23.78	192,440
20	14.07	169,370	26.56	199,410	23.48	191,700
21	14.83	171,110	26.59	199,490	23.26	191,160
22	15.92	173,620	26.53	199,340	23.06	190,670
23	17.11	176,390	26.41	199,030	22.82	190,080
24	18.27	179,120	26.32	198,800	22.53	189,370
25	18.74	180,230	26.30	198,750	22.20	188,560
26	19.07	181,020	26.25	198,630	21.88	187,780
27	20.35	184,080	26.22	198,550	21.58	187,050
28	22.18	188,510	26.28	198,700	21.31	186,400
29	23.57	191,930	26.68	199,720	20.98	185,600
30	24.43	194,060	26.87	200,200	20.72	184,970
31	25.05	195,610			20.46	184,340
Change in contents, acre-feet		+38,900		+4,590		-15,860
Change in contents, equivalent mean second-feet		+633		+77		-258

\* Add 2,900.00 feet to obtain elevation above mean sea level.

## Tieton River at Tieton Dam, near Naches, Wash.

Location.- Lat. 46°39'30", long. 121°07'20", 900 feet upstream from Wild Cat Creek, 1,200 feet downstream from Tieton Dam, 19 miles upstream from Oak Creek, and 22 miles southwest of Naches, Yakima County.

Drainage area.- 187 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 2,500 second-feet and extended to peak stage. Gage heights used to hundredths May 17 to Tieton 21; half-tenths above and hundredths below 4.4 feet May 1-16, June 22 to July 31.

Maxima.- May-June 1948: Discharge, 2,930 second-feet 10 p.m. June 11 (gage height, 6.53 feet).

1908-14, 1918-19, 1925 to April 1948: Discharge, 8,450 second-feet Dec. 22, 1933 (gage height, 9.24 feet).

Remarks.- No diversion. Flow regulated by Tieton Reservoir. Figures of discharge not adjusted for change in reservoir contents. Records collected and prepared in cooperation with Bureau of Reclamation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	518	1,060	1,200	11	145	2,790	402	21	348	1,740	890
2	869	1,280	965	12	159	2,640	488	22	238	1,600	890
3	1,040	1,980	1,320	13	154	2,240	679	23	248	1,460	890
4	1,120	2,270	1,550	14	152	1,990	1,040	24	657	1,370	890
5	1,040	2,250	1,640	15	152	1,800	1,040	25	1,690	1,320	890
6	689	2,300	1,420	16	154	2,040	1,040	26	2,040	1,280	890
7	258	2,430	1,080	17	291	2,120	1,040	27	1,230	1,280	890
8	113	2,510	730	18	428	1,890	1,040	28	1,070	897	890
9	121	2,620	446	19	451	1,730	1,040	29	1,080	905	806
10	121	2,570	345	20	439	1,690	928	30	1,090	1,320	778
								31	1,070		834
Monthly mean discharge, in second-feet.....									619	1,846	935
Runoff, in inches.....									3.81	11.01	5.76

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4					3.51	428			3.50	424		
8					3.59	464			3.03	248		
N					3.60	469			3.00	238		
4											3.00	238
8	3.51	428	3.51	428	3.60	469	3.50	424			3.01	241
12												
	May 23		May 24		May 25		May 26		May 27		May 28	
4			3.06	257	5.26	1,690	5.46	1,870	5.04	1,500		
8			3.12	277	5.27	1,700	5.81	2,210	5.03	1,490		
N	3.03	248	4.19	301	5.23	1,670	6.10	2,500				
4			4.33	353	5.24	1,680	6.10	2,500	4.57	1,100		
8			5.09	1,540	5.28	1,710	5.05	1,500	4.53	1,060		
12	3.06	257	5.19	1,630	5.37	1,790	5.04	1,500	4.53	1,060	4.55	1,080
	May 29		May 30		May 31		June 1		June 2		June 3	
4					4.56	1,090			4.56	1,090	5.31	1,740
8					4.53	1,060			4.63	1,140	5.49	1,900
N									4.77	1,260	5.65	2,050
4									4.90	1,370	5.69	2,090
8									5.04	1,500	5.76	2,160
12	4.56	1,090	4.56	1,090	4.53	1,060	4.53	1,060	5.18	1,620	5.81	2,210
	June 4		June 5		June 6		June 7		June 8		June 9	
4	5.87	2,270	5.88	2,280	5.88	2,280	6.04	2,440	6.13	2,530	6.20	2,600
8	5.89	2,290	5.85	2,260	5.90	2,300	6.05	2,450	6.11	2,510	6.25	2,650
N	5.86	2,260	5.84	2,240	5.90	2,300	6.01	2,410	6.11	2,510	6.26	2,660
4	5.87	2,270	5.82	2,220	5.89	2,290	6.02	2,420	6.08	2,480	6.19	2,590
8	5.88	2,280	5.84	2,240	5.92	2,320	6.04	2,440	6.11	2,510	6.20	2,600
12	5.85	2,250	5.88	2,280	5.97	2,370	6.08	2,480	6.20	2,600	6.20	2,600
	June 10		June 11		June 12		June 13		June 14		June 15	
4	6.19	2,590	6.21	2,610	6.39	2,790	5.96	2,360	5.66	2,060	5.46	1,870
8	6.18	2,580	6.32	2,720	6.30	2,700	5.90	2,300	5.61	2,010	5.40	1,820
N	6.15	2,550	6.50	2,900	6.23	2,630	5.84	2,240	5.60	2,000	5.36	1,780
4			6.50	2,900	6.16	2,560	5.78	2,180	5.56	1,960	5.30	1,730
8			6.48	2,880	6.09	2,490	5.72	2,120	5.52	1,930	5.31	1,740
12	6.15	2,550	6.47	2,870	6.00	2,400	5.69	2,090	5.50	1,910	5.34	1,770
	June 16		June 17		June 18		June 19		June 20		June 21	
4	5.43	1,850	5.80	2,200	5.57	1,970	5.34	1,770	5.23	1,670	5.31	1,740
8	5.58	1,980	5.80	2,200	5.52	1,930	5.32	1,750	5.25	1,680	5.31	1,740
N	5.68	2,080	5.73	2,130	5.47	1,880	5.32	1,750	5.27	1,700	5.32	1,750
4	5.77	2,170	5.68	2,080	5.41	1,830	5.27	1,700	5.27	1,700	5.33	1,760
8	5.79	2,190	5.64	2,040	5.40	1,820	5.22	1,660	5.27	1,700	5.30	1,730
12	5.80	2,200	5.60	2,000	5.37	1,790	5.22	1,660	5.28	1,710	5.28	1,710

Supplemental record.- May 17, 11 a.m., 2.70 ft., 154 sec.-ft., 1 p.m., 3.51 ft., 428 sec.-ft.; May 20, 7 a.m., 3.60 ft., 469 sec.-ft., 9 a.m., 3.50 ft., 424 sec.-ft.; May 24, 6 p.m., 5.03 ft., 1,490 sec.-ft.; May 26, 6 a.m., 5.71 ft., 2,110 sec.-ft.; May 27, 10 a.m., 4.54 ft., 1,070 sec.-ft.; June 11, 10 p.m., 6.53 ft., 2,930 sec.-ft.; June 12, 2 a.m., 6.51 ft., 2,910 sec.-ft.

## Tieton River at headworks of Tieton Canal, near Naches, Wash.

Location.- Lat. 46°40'10", long. 121°00'20", in sec. 30, T. 14 N., R. 15 E. (unsurveyed), just downstream from intake of Tieton Canal, 12 miles upstream from Oak Creek, and 16 miles southwest of Naches.

Drainage area.- 240 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurement below 2,200 second-feet and extended to peak stage. Gage heights used to hundredths May 1 to June 21; half-tenths above 3.9 feet and hundredths below June 22 to July 31.

Maxima.- May-June 1948: Discharge, 2,960 second-feet 3 p.m. June 11, 1948 (gage height, 5.67 feet).

1907 to April 1948: Discharge, 8,910 second-feet Dec. 22, 1933 (gage height, 9.70 feet).

Remarks.- Diversion for irrigation by Tieton Canal (average diversion: May, 185 second-feet; June, 280 second-feet; July, 331 second-feet). Flow regulated by Tieton Reservoir. Figures of discharge not adjusted for diversion or change in reservoir contents. Records collected and prepared in cooperation with Bureau of Reclamation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	448	1,120	912	11	94	2,860	342	21	477	1,610	556
2	863	1,290	701	12	114	2,580	161	22	372	1,490	556
3	1,030	1,980	945	13	106	2,220	300	23	359	1,300	570
4	1,120	2,220	1,200	14	97	1,870	685	24	859	1,200	563
5	1,070	2,150	1,340	15	94	1,640	685	25	1,980	1,160	563
6	754	2,220	1,160	16	106	2,020	685	26	2,300	1,120	563
7	311	2,390	810	17	216	2,080	685	27	1,510	1,070	563
8	99	2,480	570	18	385	1,800	693	28	1,300	779	563
9	90	2,550	168	19	419	1,620	693	29	1,220	615	502
10	84	2,550	53	20	532	1,570	615	30	1,180	1,030	434
								31	1,150		502
Monthly mean discharge, in second-feet.....									669	1,753	624
Runoff, in inches.....									3.21	8.15	3.00

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	2.18	111	2.90	384	2.89	379	3.17	550	3.14	529	2.88	374
8	2.18	111	2.90	384	2.89	379			3.12	516	2.85	358
N	2.18	111	2.90	384	2.96	418			3.11	509	2.82	343
4	2.88	374	2.89	379	3.02	452	3.12	516	2.88	374	2.86	364
8	2.89	379	2.91	390	3.02	452	3.19	563			2.93	401
12	2.90	384	2.91	390	3.07	483	3.17	550	2.92	395	2.90	384
	May 23		May 24		May 25		May 26		May 27		May 28	
4	2.86	364	2.85	358	4.63	1,860	5.03	2,260			4.05	1,300
8	2.83	348	2.83	348	4.71	1,940			4.49	1,720	4.09	1,340
N	2.80	333	3.59	886	4.75	1,980					4.07	1,320
4	2.83	348			4.81	2,040			4.07	1,320	4.04	1,290
8	2.89	379	4.48	1,710	4.88	2,110	4.48	1,710	4.05	1,300	4.02	1,270
12	2.89	379	4.55	1,780	4.93	2,160	4.54	1,770	4.05	1,300	4.01	1,260
	May 29		May 30		May 31		June 1		June 2		June 3	
4	4.00	1,250	3.92	1,180	3.90	1,160	3.88	1,140	3.85	1,120	4.49	1,720
8	3.97	1,220	3.91	1,170	3.90	1,160	3.86	1,120	3.89	1,150	4.68	1,910
N	3.95	1,200	3.90	1,160	3.90	1,160	3.84	1,110	3.98	1,230	4.83	2,060
4	3.94	1,200	3.92	1,180	3.88	1,140	3.84	1,110	4.15	1,390	4.89	2,120
8	3.94	1,200	3.93	1,190	3.88	1,140	3.85	1,120	4.27	1,510	4.95	2,180
12	3.94	1,200	3.92	1,180	3.88	1,140	3.85	1,120	4.38	1,610	4.98	2,210
	June 4		June 5		June 6		June 7		June 8		June 9	
4	5.00	2,230	4.94	2,170	5.00	2,230	5.18	2,420	5.24	2,480	5.31	2,560
8	5.01	2,240	4.93	2,160	4.98	2,210	5.17	2,410	5.25	2,500	5.30	2,550
N	4.98	2,210	4.90	2,130	4.97	2,200	5.11	2,340	5.24	2,480	5.23	2,580
4	4.98	2,210	4.89	2,120	4.98	2,210	5.13	2,350	5.22	2,460	5.28	2,530
8	5.01	2,240	4.90	2,130	5.01	2,240	5.18	2,420	5.25	2,500	5.29	2,540
12	4.94	2,170	4.94	2,170	5.08	2,310	5.20	2,440	5.29	2,540	5.30	2,550
	June 10		June 11		June 12		June 13		June 14		June 15	
4	5.30	2,550	5.51	2,780	5.50	2,770	5.01	2,240	4.75	1,980	4.47	1,700
8	5.27	2,520	5.59	2,870	5.42	2,680	4.94	2,170	4.70	1,930	4.43	1,660
N	5.25	2,500	5.65	2,940	5.32	2,570	4.88	2,010	4.64	1,870	4.36	1,590
4	5.37	2,630	5.66	2,950	5.22	2,460	4.82	2,050	4.57	1,800	4.34	1,570
8	5.31	2,560	5.62	2,900	5.16	2,400	4.79	2,020	4.56	1,790	4.36	1,590
12	5.30	2,550	5.56	2,840	5.08	2,310	4.76	1,990	4.53	1,760	4.43	1,660
	June 16		June 17		June 18		June 19		June 20		June 21	
4	4.58	1,810	4.91	2,140	4.65	1,880	4.43	1,660	4.33	1,560	4.38	1,610
8	4.80	2,030	4.91	2,140	4.60	1,830	4.41	1,640	4.34	1,570	4.39	1,620
N	4.84	2,070	4.87	2,100	4.57	1,800	4.41	1,640	4.35	1,580	4.39	1,620
4	4.90	2,130	4.80	2,030	4.51	1,740	4.36	1,590	4.35	1,580	4.41	1,640
8	4.92	2,150	4.77	2,000	4.50	1,730	4.35	1,560	4.34	1,570	4.38	1,610
12	4.92	2,150	4.72	1,950	4.47	1,700	4.32	1,550	4.36	1,590	4.35	1,580

Supplemental record.- May 17, 2 p.m., 2.17 ft., 109 sec.-ft., 3 p.m., 2.86 ft., 364 sec.-ft.; May 20, 9 a.m., 3.19 ft., 563 sec.-ft., 10 a.m., 3.09 ft., 496 sec.-ft., 2 p.m., 3.09 ft., 496 sec.-ft.; May 21, 3 p.m., 3.13 ft., 522 sec.-ft., 6 p.m., 2.93 ft., 401 sec.-ft.; May 24, 10 a.m., 2.85 ft., 358 sec.-ft., 2 p.m., 3.66 ft., 946 sec.-ft., 6 p.m., 3.85 ft., 1,120 sec.-ft.; May 26, 9 a.m., 5.14 ft., 2,370 sec.-ft., 10 a.m., 5.34 ft., 2,590 sec.-ft., 2 p.m., 5.37 ft., 2,630 sec.-ft., 6 p.m., 5.40 ft., 2,680 sec.-ft., May 27, 2 a.m., 4.58 ft., 1,810 sec.-ft., 10 a.m., 4.46 ft., 1,690 sec.-ft., 11 a.m., 4.08 ft., 1,330 sec.-ft.; June 11, 3 p.m., 5.67 ft., 2,960 sec.-ft.

## North Fork Ahtanum Creek near Tampico, Wash.

Location.- Lat. 46°33'40", long. 120°55'10", in NW $\frac{1}{4}$  sec. 2, T. 12 N., R. 15 E., 100 feet downstream from Nasty Creek,  $3\frac{1}{2}$  miles northwest of Tampico and mouth of South Fork, and 20 miles west of Yakima.

Drainage area.- 69 square miles.

Gage-height record.- Water-stage recorder graph except for period 11:30 a.m. May 29 to 10:00 a.m. May 31, when there was no gage-height record.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 523 second-feet and extended to peak stage. Discharge for period of no gage-height record computed on basis of fragmentary gage-height record and interpolation.

Maxima.- May-June 1948: Discharge, 770 second-feet 5 a.m. May 27 (gage height, 2.97 feet). 1907-24, 1931 to April 1948: Discharge, 755 second-feet Dec. 22, 1935; gage height, 4.6 feet June 18, 1916.

Remarks.- No diversion of importance. No regulation. Records collected in cooperation with Office of Indian Affairs.

## Mean discharge, in second-feet, 1948

Monthly mean discharge, in second-feet, 1940											
Day	May	June	July	Day	May	June	July	Day	May	June	July
1	104	408	140	11	167	553	88	21	374	320	66
2	102	423	132	12	172	480	82	22	436	289	60
3	112	466	125	13	175	435	80	23	460	268	62
4	117	448	117	14	167	399	78	24	475	244	60
5	121	436	117	15	167	371	73	25	517	226	57
6	158	449	117	16	172	523	70	26	558	208	56
7	191	454	106	17	183	444	70	27	692	194	54
8	182	451	102	18	182	404	84	28	646	179	54
9	172	495	96	19	201	369	72	29	544	167	54
10	172	446	92	20	307	352	68	30	480	153	50
								31	414		48
Monthly mean discharge, in second-feet.....									287	368	81.6
Runoff, in inches .....									4.80	5.96	1.36

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	1.16	186	1.15	184	1.18	189	1.53	278	1.86	374	2.05	433
8	1.15	184	1.14	182	1.17	186	1.63	306	1.83	365	2.01	419
N	1.14	182	1.13	179	1.20	194	1.62	303	1.77	347	2.02	423
4	1.13	179	1.12	177	1.25	206	1.65	312	1.78	350	2.03	426
8	1.15	184	1.15	184	1.29	216	1.74	358	1.97	409	2.13	460
12	1.15	184	1.18	191	1.39	241	1.85	371	2.04	433	2.19	481
	May 23		May 24		May 25		May 26		May 27		May 28	
4	2.14	460	2.21	481	2.35	529	2.43	555	2.95	762	2.73	669
8	2.08	440	2.13	453	2.31	514	2.40	544	2.83	711	2.73	669
N	2.09	443	2.12	450	2.20	474	2.30	507	2.70	657	2.72	665
4	2.09	443	2.12	450	2.21	478	2.35	518	2.65	637	2.63	629
8	2.20	481	2.26	499	2.39	544	2.54	598	2.68	649	2.60	617
12	2.25	499	2.37	540	2.49	582	2.73	673	2.74	673	2.52	586
	May 29		May 30		May 31		June 1		June 2		June 3	
4	2.42	548					2.05	416	2.05	416	2.18	460
8	2.37	529					2.03	409	2.02	406	2.15	450
N	2.35	522			2.03	409	1.99	397	1.98	394	2.12	440
4					2.03	409	1.99	397	2.04	412	2.20	467
8					2.06	419	2.03	409	2.20	467	2.28	496
12					2.06	419	2.06	419	2.19	464	2.28	496
	June 4		June 5		June 6		June 7		June 8		June 9	
4	2.20	467	2.12	440	2.14	447	2.19	464	2.16	453	2.34	498
8	2.18	460	2.04	412	2.08	426	2.12	440	2.09	430	2.25	451
N	2.05	416	1.99	397	2.01	403	2.06	419	2.04	412	2.16	453
4	2.04	412	2.08	426	2.12	440	2.12	440	2.06	419	2.17	457
8	2.17	457	2.22	474	2.28	496	2.25	478	2.21	471	2.36	525
12	2.18	460	2.22	474	2.27	492	2.22	474	2.46	563	2.30	503
	June 10		June 11		June 12		June 13		June 14		June 15	
4	2.22	474	2.33	514	2.34	518	2.14	447	2.06	419	1.90	368
8	2.14	447	2.56	601	2.27	492	2.09	430	2.01	403	1.87	359
N	2.05	416	2.56	601	2.21	471	2.07	423	1.98	394	1.85	353
4	2.01	403	2.43	551	2.16	453	2.08	426	1.97	391	1.82	344
8	2.16	453	2.39	536	2.15	450	2.11	436	1.95	384	2.00	400
12	2.25	485	2.36	525	2.19	464	2.09	430	1.94	381	2.15	450
	June 16		June 17		June 18		June 19		June 20		June 21	
4	2.38	533	2.20	467	2.04	412	1.94	381	1.87	359	1.78	332
8	2.50	578	2.16	453	2.03	409	1.92	374	1.88	362	1.78	326
N	2.37	529	2.11	436	2.02	406	1.88	362	1.85	355	1.73	318
4	2.35	522	2.08	426	1.97	391	1.86	356	1.83	347	1.69	306
8	2.31	507	2.09	430	1.99	397	1.88	362	1.81	341	1.72	315
12	2.25	485	2.07	423	1.99	397	1.88	362	1.81	341	1.69	306

Supplemental record.- May 27, 5 a.m., 2.97 ft., 770 sec.-ft.; May 31, 10 a.m., 2.04 ft., 412 sec.-ft.; June 9, 2 p.m., 2.14 ft., 447 sec.-ft.; June 10, 6 p.m., 2.02 ft., 406 sec.-ft.; June 11, 10 a.m., 2.61 ft., 621 sec.-ft.; June 15, 6 p.m., 1.84 ft., 350 sec.-ft.

South Fork Ahtanum Creek at Conrad Ranch, near Tampico, Wash.

Location.- Lat. 46°30'30", long. 120°54'50", in W $\frac{1}{2}$  sec. 23, T. 12 N., R. 15 E., at Conrad Ranch, 2 $\frac{1}{2}$  miles upstream from North Fork, 2 $\frac{1}{2}$  miles southwest of Tampico, and 20 miles southwest of Yakima.

Drainage area.- 24.5 square miles.

Gage-height record.- Graph based on twice-daily staff-gage readings and water-stage recorder graph for North Fork Ahtanum Creek near Tampico May 17 to June 21; mean of twice-daily staff-gage readings May 1-16, June 22 to July 31.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 135 second-feet and extended to peak stage. Gage heights used to hundredths. Shifting-control method used May 1-26.

Maxima.- May-June 1948: Discharge observed, 263 second-feet 8 a.m. June 16 (gage height, 2.34 feet).

1915-24, 1931 to April 1948: Discharge observed, 424 second-feet Dec. 23, 1933 (gage height, 3.10 feet).

Remarks.- Several diversions above station for irrigation. Gage-height record collected in cooperation with Office of Indian Affairs which furnished several discharge measurements.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	30	101	42	11	46	168	25	21	98	100	21
2	31	98	41	12	51	155	25	22	117	92	21
3	32	110	38	13	53	145	25	23	130	89	19
4	34	110	37	14	50	121	25	24	146	78	19
5	37	110	36	15	50	118	25	25	153	66	19
6	39	115	35	16	50	238	24	26	155	59	18
7	43	118	32	17	53	211	23	27	188	51	18
8	45	122	31	18	54	168	25	28	175	48	18
9	47	128	31	19	66	137	22	29	145	47	17
10	48	151	29	20	87	115	21	30	126	45	17
								31	116		17
Monthly mean discharge, in second-feet									80.5	114	25.7
Runoff, in inches									3.79	5.18	1.21

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	1.20	53	1.21	55	1.21	56	1.47	86	1.52	94	1.62	109
8	1.20	53	1.21	55	1.21	56	1.47	86	1.52	94	1.62	109
N	1.20	53	1.20	54	1.26	61	1.43	81	1.51	93	1.64	112
4	1.20	53	1.20	54	1.36	72	1.47	86	1.56	99	1.69	120
8	1.20	53	1.21	55	1.45	83	1.54	95	1.63	109	1.75	130
12	1.20	53	1.21	55	1.47	85	1.53	94	1.62	108	1.76	131
	May 23		May 24		May 25		May 26		May 27		May 28	
4	1.75	131	1.80	142	1.88	158	1.86	156	2.03	193	2.03	193
8	1.72	126	1.80	142	1.85	152	1.82	149	2.02	191	2.00	187
N	1.71	125	1.80	142	1.84	150	1.80	145	2.00	187	1.95	177
4	1.73	128	1.82	145	1.84	150	1.82	149	1.99	185	1.90	167
8	1.77	135	1.88	156	1.85	152	1.90	163	2.01	189	1.83	154
12	1.80	140	1.89	158	1.86	154	1.99	180	2.02	191	1.82	152
	May 29		May 30		May 31		June 1		June 2		June 3	
4	1.83	154	1.68	128	1.71	133	1.55	108	1.48	97	1.58	112
8	1.83	154	1.65	123	1.65	123	1.50	100	1.45	93	1.57	110
N	1.75	140	1.63	120	1.52	103	1.48	97	1.43	90	1.53	104
4	1.75	140	1.64	121	1.54	106	1.48	97	1.45	93	1.55	108
8	1.75	140	1.68	128	1.57	110	1.50	100	1.52	103	1.58	112
12	1.72	134	1.72	134	1.57	110	1.52	103	1.60	115	1.62	118
	June 4		June 5		June 6		June 7		June 8		June 9	
4	1.60	115	1.57	110	1.61	117	1.63	120	1.67	126	1.72	134
8	1.55	108	1.54	106	1.58	112	1.59	114	1.62	118	1.63	120
N	1.49	99	1.52	103	1.54	106	1.56	109	1.58	112	1.57	110
4	1.51	102	1.54	106	1.57	110	1.58	112	1.58	112	1.62	118
8	1.60	115	1.62	118	1.63	120	1.65	123	1.68	128	1.72	134
12	1.62	118	1.63	120	1.67	126	1.69	129	1.80	148	1.87	161
	June 10		June 11		June 12		June 13		June 14		June 15	
4	1.84	156	1.92	171	1.85	158	1.82	152	1.68	128	1.59	114
8	1.77	143	1.90	167	1.85	158	1.80	148	1.65	123	1.57	110
N	1.71	133	1.97	181	1.83	154	1.80	148	1.61	117	1.56	109
4	1.78	145	1.92	171	1.81	150	1.77	143	1.61	117	1.55	108
8	1.87	161	1.83	154	1.84	156	1.73	136	1.62	118	1.67	126
12	1.94	175	1.82	152	1.83	154	1.72	134	1.60	115	1.90	167
	June 16		June 17		June 18		June 19		June 20		June 21	
4	2.13	215	2.23	237	1.98	183	1.78	145	1.68	128	1.52	103
8	2.34	263	2.19	228	1.95	177	1.74	138	1.63	120	1.52	103
N	2.28	248	2.12	212	1.91	169	1.72	134	1.57	110	1.51	102
4	2.28	248	2.02	191	1.85	158	1.70	131	1.54	106	1.47	96
8	2.28	248	1.98	183	1.83	154	1.71	133	1.53	104	1.46	94
12	2.27	246	1.98	183	1.80	148	1.70	131	1.55	108	1.44	92



## Snake River at Oxbow, Oregon

Location.- Lat. 44°57', long. 116°51', in NW $\frac{1}{4}$  sec. 16, T. 7 S., R. 48 E., at Oxbow, five-eighths of a mile upstream from intake of diversion tunnel for Oxbow power plant.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Shifting-control method used May 1 to July 31.

Maxima.- May-June 1948: Discharge, 55,100 second-feet 4:30 a.m. June 5 (gage height, 17.55 feet).

1923 to April 1948: Discharge, 74,600 second-feet Apr. 21, 1943 (gage height, 20.71 feet).

Remarks.- Flow regulated by many reservoirs. Many diversions above station for irrigation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	28,800	41,800	25,000	11	25,500	51,000	11,600	21	34,200	24,800	10,200
2	27,400	40,400	23,100	12	23,400	47,800	11,300	22	33,900	25,000	10,200
3	25,900	43,800	20,900	13	22,200	44,000	10,700	23	36,300	25,000	9,950
4	25,000	51,000	17,600	14	24,300	39,400	10,700	24	37,400	24,400	9,630
5	26,600	54,200	15,600	15	27,400	36,500	10,400	25	38,400	22,900	9,830
6	26,000	52,900	14,300	16	25,600	37,100	10,200	26	40,900	22,800	9,980
7	25,600	52,500	13,500	17	26,000	37,500	10,200	27	45,200	29,400	10,200
8	28,000	53,000	13,100	18	26,700	33,100	10,300	28	49,700	30,800	10,300
9	29,200	52,800	12,900	19	30,500	28,800	10,200	29	51,000	27,000	10,400
10	28,800	52,200	12,100	20	33,100	26,400	10,000	30	48,400	25,500	10,500
								31	46,200		
Monthly mean discharge, in second-feet								32,170			
Runoff, in inches								-			

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	12.40	26,000	12.44	26,300	13.23	30,400	13.65	32,700	14.00	34,500	13.84	33,600
8	12.44	26,200	12.62	27,200	13.37	31,100	13.82	33,600	13.90	34,000	13.91	34,000
N	12.36	25,800	12.70	27,600	13.40	31,300	14.00	34,500	13.78	33,400	14.04	34,700
8	May 23		May 24		May 25		May 26		May 27		May 28	
4	14.30	36,200	14.56	37,600	14.71	38,500	15.12	40,800	15.84	44,900	16.68	49,900
8	14.40	36,700	14.48	37,200	14.71	38,500	15.15	41,000	15.97	45,700	16.80	50,500
N	14.52	37,400	14.49	37,200	14.82	39,100	15.42	42,500	16.24	47,200	16.76	50,300
8	May 29		May 30		May 31		June 1		June 2		June 3	
4	16.94	51,400	16.50	48,800	16.21	47,100	15.37	42,300	15.04	40,400	15.64	43,800
8	16.93	51,300	16.34	47,900	16.00	45,900	15.15	41,000	14.98	40,200	15.72	44,300
N	16.70	50,000	16.22	47,200	15.71	44,200	15.00	40,200	15.10	40,800	15.96	45,800
8	June 4		June 5		June 6		June 7		June 8		June 9	
4	16.63	49,700	17.53	55,000	17.27	53,400	17.10	52,400	17.21	53,100	17.17	52,900
8	17.20	53,000	17.33	53,800	17.12	52,500						
N	17.49	54,700	17.23	53,200	17.11	52,500	17.15	52,700	17.19	52,900	17.14	52,700
8	June 10		June 11		June 12		June 13		June 14		June 15	
4	17.06	52,200	16.95	51,600	16.30	47,800	15.70	44,300	14.79	39,200	14.32	36,600
8			16.80	50,700			15.55	43,400	14.68	38,500	14.20	35,900
N	17.00	51,900	16.62	49,700	15.99	46,000	15.44	42,800	14.57	37,900	14.21	36,000
8	June 16		June 17		June 18		June 19		June 20		June 21	
4	14.27	36,300	14.63	38,300	13.64	33,000	12.78	28,400	12.34	26,200	12.01	24,500
8	14.57	37,900	14.46	37,400							12.04	24,600
N	14.65	38,400	14.12	35,400	13.28	31,000	12.61	27,500	12.26	25,800	12.10	25,000

## Snake River near Clarkston, Wash.

Location.- Lat. 46°25'30", long. 117°10'30", in lot 1, sec. 16, T. 11 N., R. 45 E., 2 miles upstream from Alpowa Creek, 7 miles downstream from Clarkston, and 134 miles upstream from mouth. Datum of gage is 670 feet above mean sea level (Corps of Engineers bench mark).

Drainage area.- 103,200 square miles.

Gage-height record.- Water-stage recorder graph, except for period 1 p.m. May 29 to 1 a.m. May 30, for which a graph was drawn based on floodmark in gage house.

Discharge record.- Stage-discharge relation defined below 285,000 second-feet by 33 current-meter measurements; extended to crest gage height by use of the first difference curve. Gage height used to hundredths May 17 to June 21; tenths May 1-16 and June 22 to July 31.

Maxima.- May-June 1948: Discharge, 368,200 second-feet 6 p.m. May 29 (gage height, 40.36 feet, from floodmarks).

1909 to April 1948: Discharge observed, 270,000 second-feet May 20, 1921 (gage height, 19.0 feet, site and datum then in use at Riparia).

The flood of June 5, 1894, reached a discharge of 409,000 second-feet (gage height, 24.7 feet, site and datum at Riparia, determined from floodmarks by U. S. Weather Bureau).

Remarks.- Small diversions by pumping between this station and station at Oxbow, Oreg. Large diurnal fluctuation caused by power plant on Clearwater River above Lewiston, Idaho.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	106,000	263,900	89,700	11	134,000	238,900	47,700	21	233,900	125,400	37,200
2	101,000	257,300	86,900	12	127,000	225,100	45,600	22	263,200	134,000	36,200
3	93,700	270,000	81,500	13	128,000	230,900	44,300	23	280,800	129,000	33,800
4	95,700	290,600	74,300	14	136,000	192,700	42,400	24	254,500	120,000	32,200
5	96,700	275,000	68,300	15	134,000	173,400	40,400	25	251,900	112,000	31,100
6	95,700	262,700	63,500	16	134,000	168,600	38,600	26	269,400	107,000	30,600
7	112,000	261,800	58,700	17	145,300	160,300	37,400	27	291,800	102,000	30,000
8	136,000	264,400	55,500	18	169,000	147,800	36,200	28	320,800	104,000	32,200
9	153,000	259,600	52,600	19	183,600	136,000	36,200	29	349,500	99,700	43,000
10	142,000	252,000	49,800	20	216,300	126,900	38,000	30	329,900	93,700	40,400
								31	285,700		35,600
Monthly mean discharge, in second-feet.....									186,100	185,200	47,420
Runoff, in inches.....									2.08	2.00	0.53

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	25.48	135,900	27.25	157,100	28.92	178,400	30.62	201,300	32.47	227,600	32.81	232,800
8	25.83	140,100	27.80	163,800	29.02	179,700	31.30	210,800	32.87	233,600	33.29	240,000
N	26.30	145,700	28.36	171,100	29.20	182,000	32.08	221,800	33.20	238,600	34.08	252,600
4	26.77	151,500	28.83	177,200	29.51	186,000	32.40	226,600	33.17	238,200	35.72	280,200
8	27.00	154,100	28.90	178,100	29.74	189,000	32.46	227,500	33.04	236,200	36.99	303,000
12	27.07	154,900	28.94	178,600	30.10	194,000	32.36	226,000	32.77	232,200	37.34	309,400
	May 23		May 24		May 25		May 26		May 27		May 28	
4	36.79	299,400	34.34	256,800	33.48	243,000	34.29	255,900	35.54	277,200	36.89	301,200
8	35.92	283,800	34.36	257,100	33.88	249,400	34.83	265,100	36.12	287,400	37.61	314,500
N	35.59	278,000	34.36	257,100	34.37	257,300	35.44	275,500	36.72	298,200	38.32	328,000
4	35.21	271,600	34.19	254,300	34.45	258,600	35.69	279,700	36.96	302,500	38.62	333,700
8	34.92	266,600	33.88	249,400	34.31	256,300	35.55	277,400	36.81	299,800	38.62	333,700
12	34.59	261,000	33.49	243,100	34.05	252,100	35.36	274,100	36.66	297,100	38.45	330,400
	May 29		May 30		May 31		June 1		June 2		June 3	
4	38.48	331,000	39.39	348,800	36.33	291,100	34.85	265,400	33.90	249,700	34.32	256,400
8	38.74	336,000	38.95	340,000	36.30	290,600	34.88	266,000	34.23	255,000	34.76	263,900
N	39.60	353,000	38.54	332,200	36.32	291,000	34.96	267,300	34.66	262,200	35.25	272,200
4	40.23	365,600	37.96	321,100	35.95	283,900	34.85	265,400	34.73	263,400	35.51	276,700
8	40.26	366,200	37.35	309,600	35.44	275,500	34.46	258,800	34.52	259,800	35.72	280,200
12	39.66	358,200	36.67	297,300	35.03	268,500	34.06	252,300	34.26	255,500	36.06	286,300
	June 4		June 5		June 6		June 7		June 8		June 9	
4	36.35	291,500	35.65	279,000	34.60	261,200	34.26	255,500	34.41	258,000	34.38	257,500
8	36.48	293,900	35.53	277,000	34.62	261,500	34.48	259,200	34.69	262,700	34.57	260,700
N	36.51	294,400	35.50	276,500	34.83	265,100	34.94	267,000	35.11	269,900	34.81	264,800
4	36.40	292,400	35.37	274,300	34.87	265,800	34.98	267,700	35.09	269,500	34.67	262,400
8	36.12	287,400	35.09	269,500	34.64	261,900	34.74	263,600	34.97	265,800	34.34	256,800
12	35.85	282,500	34.79	264,400	34.34	256,800	34.46	258,900	34.53	260,000	34.00	251,300
	June 10		June 11		June 12		June 13		June 14		June 15	
4	33.79	247,900	33.18	238,300	32.70	231,100	30.83	204,200	30.30	196,800	28.70	175,500
8	34.05	252,300	33.12	237,400	32.58	229,300	30.56	200,400	30.25	196,100	28.50	172,900
N	34.35	257,000	33.33	240,600	32.52	228,400	30.50	199,600	30.16	194,800	28.52	173,200
4	34.34	256,800	33.34	240,700	32.33	225,600	30.44	198,800	29.94	191,800	28.52	173,200
8	33.99	251,100	33.15	237,800	31.66	215,800	30.40	198,200	29.58	186,800	28.40	171,600
12	33.46	242,700	32.90	234,100	31.26	210,200	30.37	197,800	29.13	180,700	28.17	168,600
	June 16		June 17		June 18		June 19		June 20		June 21	
4	28.38	171,300	27.63	161,700	26.83	152,100	25.64	137,800	24.89	129,300	24.30	122,800
8	28.34	170,800	27.58	161,100	26.62	149,500	25.58	137,100	24.75	127,800	24.31	122,900
N	28.32	170,600	27.60	161,300	26.49	148,000	25.58	137,100	24.56	125,700	24.44	124,300
4	28.16	168,500	27.50	160,100	26.34	146,200	25.44	135,400	24.60	126,100	24.65	126,600
8	27.97	166,000	27.28	157,500	26.09	143,200	25.28	133,600	24.52	125,200	24.78	128,100
12	27.79	163,700	27.12	155,500	25.80	139,700	25.01	130,600	24.44	124,300	24.92	129,600



## Snake River near Clarkston, Wash.--Continued

Supplemental record:

May 25, 2 a.m., 33.42 ft., 242,000 sec.-ft.  
29, 2 a.m., 38.44 ft., 330,300 sec.-ft.; 6 p.m., 40.36 ft., 368,200 sec.-ft.  
31, 6 a.m., 36.24 ft., 289,500 sec.-ft.

June 8, 3 p.m., 35.18 ft., 271,100 sec.-ft.  
12, 1 p.m., 32.80 ft., 232,600 sec.-ft.; 5:30 p.m., 31.54 ft., 214,100 sec.-ft.  
14, 2 a.m., 30.46 ft., 199,000 sec.-ft.; 10 p.m., 29.30 ft., 183,300 sec.-ft.  
15, 6 p.m., 28.40 ft., 171,600 sec.-ft.  
16, 2 a.m., 28.02 ft., 166,700 sec.-ft.; 6 a.m., 28.26 ft., 169,800 sec.-ft.;  
10 a.m., 28.36 ft., 171,100 sec.-ft.  
17, 2 p.m., 27.60 ft., 161,300 sec.-ft.  
18, 2 a.m., 26.98 ft., 153,900 sec.-ft.  
20, 10 a.m., 24.74 ft., 127,600 sec.-ft.; 2 p.m., 24.49 ft., 124,900 sec.-ft.;  
10 p.m., 24.46 ft., 124,600 sec.-ft.  
21, 11 p.m., 24.98 ft., 130,300 sec.-ft.

## Payette River Basin

## Payette River near Payette, Idaho

Location.- Lat. 44°02'30", long. 116°55'30", in SW $\frac{1}{4}$  sec. 10, T. 8 N., R. 5 W., at highway bridge, 1 $\frac{1}{2}$  miles south of Payette.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge, 15,900 second-feet 4 a.m. June 4 (gage height, 10.62 feet).

1935 to April 1948: Discharge observed, 23,400 second-feet May 2, 1938 (gage height, 11.90 feet).

Remarks.- Many diversions above station for irrigation. Flow regulated by Black Canyon Dam and reservoirs on tributary streams.

## Mean discharge, in second-feet, 1948

mean discharge, in second-feet, 1948											
Day	May	June	July	Day	May	June	July	Day	May	June	July
1	6,720	11,200	3,180	11	6,190	13,500	1,890	21	10,600	9,100	1,470
2	6,100	11,900	3,350	12	5,860	12,700	1,640	22	10,500	9,420	1,470
3	5,710	13,500	3,120	13	5,820	11,400	1,740	23	10,500	8,900	1,350
4	6,280	15,200	2,780	14	5,490	10,700	1,670	24	10,200	8,220	1,230
5	6,150	13,700	2,780	15	4,730	9,250	1,550	25	10,600	8,120	1,420
6	5,910	13,600	2,820	16	7,070	10,200	1,460	26	11,200	7,840	1,470
7	6,400	14,030	2,690	17	8,000	10,300	1,460	27	12,400	7,310	1,590
8	7,590	14,400	2,560	18	9,070	9,760	1,490	28	13,000	4,620	1,500
9	7,450	14,600	2,340	19	10,000	9,550	1,440	29	13,500	3,450	1,520
10	6,690	14,400	2,220	20	11,300	8,760	1,420	30	13,200	3,200	1,500
								31	11,500		1,490
Monthly mean discharge, in second-feet.....									8,572	10,430	1,922
Runoff, in inches.....									-	-	-

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	8.00	7,690	8.20	8,190	8.75	9,670	9.28	11,200	9.06	10,600	9.01	10,400
8	7.83	7,280	8.18	8,140	8.73	9,610	9.36	11,500	8.99	10,400	8.95	10,200
N	7.95	7,570	8.42	8,760	8.64	9,360	9.23	11,100	8.96	10,300	8.96	10,300
4	8.34	8,550	8.83	9,900	8.95	10,200	9.36	11,500	9.17	10,900	9.07	10,600
8	8.44	8,820	8.90	10,100	9.14	10,800	9.35	11,400	9.20	11,000	9.12	10,800
12	8.40	8,710	8.88	10,000	9.21	11,000	9.14	10,800	9.06	10,600	9.07	10,600
	May 23		May 24		May 25		May 26		May 27		May 28	
4	9.05	10,600	8.93	10,200	8.86	9,980	9.15	10,800	9.61	12,200	9.68	12,500
8	9.07	10,600	8.83	9,900	8.85	9,960	9.15	10,800	9.47	11,800	9.61	12,200
N	9.07	10,600	8.84	9,930	9.03	10,500	9.18	10,900	9.54	12,000	9.83	13,000
4	9.07	10,600	9.05	10,600	9.26	11,200	9.49	11,900	9.78	12,800	9.95	13,400
8	8.94	10,200	8.98	10,300	9.33	11,400	9.53	12,000	9.77	12,800	10.08	13,800
12	8.98	10,300	8.90	10,100	9.16	10,900	9.60	12,200	9.77	12,800	10.02	13,700
	May 29		May 30		May 31		June 1		June 2		June 3	
4	10.07	13,800	9.97	13,500	9.54	12,000	9.18	10,900	9.36	11,500	9.64	12,400
8	10.00	13,600	9.90	13,200	9.51	12,000	9.19	11,000	9.33	11,400	9.74	12,700
N	9.90	13,200	9.86	13,100	9.24	11,100	9.24	11,100	9.43	11,700	9.87	13,100
4	9.92	13,300	9.83	13,000	9.19	11,000	9.39	11,600	9.66	12,400	10.15	14,100
8	9.97	13,500	9.81	12,900	9.16	10,900	9.40	11,600	9.67	12,500	10.39	15,000
12	10.03	13,700	9.72	12,700	9.17	10,900	9.41	11,600	9.64	12,400	10.48	15,300
	June 4		June 5		June 6		June 7		June 8		June 9	
4	10.62	15,900	10.14	14,100	9.94	13,400	10.07	13,800	10.17	14,200	10.31	14,700
8	10.61	15,800	9.96	13,400	9.92	13,300	10.01	13,600	10.16	14,100	10.27	14,600
N	10.46	15,200	9.95	13,400	9.93	13,300	9.98	13,500	10.15	14,100	10.18	14,200
4	10.40	15,000	10.07	13,800	10.07	13,800	10.22	14,400	10.28	14,600	10.31	14,700
8	10.34	14,800	10.07	13,800	10.15	14,100	10.23	14,400	10.28	14,600	10.34	14,800
12	10.20	14,300	9.97	13,500	10.04	13,700	10.28	14,600	10.32	14,800	10.29	14,700
	June 10		June 11		June 12		June 13		June 14		June 15	
4	10.37	14,900	9.97	13,500	9.80	12,900	9.52	12,000	9.26	11,200	8.87	10,000
8	10.17	14,200	9.95	13,400	9.80	12,900	9.49	11,900	9.34	11,400	8.75	9,670
N	10.18	14,200	10.02	13,700	9.80	12,900	9.48	11,800	9.27	11,200	8.58	8,660
4	10.23	14,400	9.95	13,400	9.65	12,400	8.87	10,000	9.02	10,500	8.18	8,140
8	10.19	14,300	9.98	13,500	9.60	12,200	9.10	10,700	8.72	9,590	8.63	9,350
12	10.15	14,100	9.91	13,200	9.57	12,100	9.29	11,300	8.75	9,670	8.78	9,750
	June 16		June 17		June 18		June 19		June 20		June 21	
4	8.88	10,000	9.00	10,400	8.88	10,000	8.70	9,530	8.60	9,250	8.45	8,840
8	8.93	10,200	8.99	10,400	8.81	9,840	8.66	9,420	8.58	9,200	8.50	8,980
N	8.93	10,200	8.94	10,200	8.74	9,640	8.74	9,640	8.30	8,450	8.53	9,060
4	8.99	10,400	8.96	10,300	8.74	9,640	8.78	9,150	8.14	8,040	8.67	9,450
8	9.00	10,400	8.93	10,200	8.74	9,640	8.66	9,420	8.33	8,530	8.59	9,220
12	8.94	10,200	8.85	9,960	8.73	9,610	8.67	9,450	8.41	8,740	8.66	9,420

## Burnt River Basin

Burnt River near Hereford, Oreg.

Location.- Lat. 44°30', long. 118°11', in SE $\frac{1}{4}$  sec. 21, T. 12 S., R. 37 E., at entrance to canyon, 1,250 feet downstream from Unity Dam, 0.7 mile downstream from South Fork, and 7 miles west of Hereford.

Drainage area.- 309 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge, 476 second-feet May 21, 22 (gage height, 4.12 feet).

1915-16, 1928 to April 1948: Discharge, 2,220 second-feet Apr. 17, 1943 (gage height, 4.06 feet, caused by opening automatic spillway gates), from rating curve extended above 1,300 second-feet by logarithmic plotting.

Remarks.- Flow regulated by Unity Reservoir.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	190	386	124	11	190	428	112	21	476	146	120
2	192	251	124	12	192	398	114	22	470	180	119
3	146	218	125	13	192	386	114	23	467	174	118
4	128	263	122	14	192	275	122	24	467	164	113
5	137	281	127	15	222	185	125	25	464	162	116
6	139	281	125	16	254	168	122	26	461	144	118
7	139	281	118	17	254	155	120	27	461	140	120
8	147	284	120	18	278	140	116	28	461	134	116
9	156	287	120	19	344	132	119	29	455	134	101
10	188	311	119	20	419	132	122	30	452	130	93
								31	458		92
Monthly mean discharge, in second-feet .....									296	225	117
Runoff, in inches .....									1.11	0.81	0.44

## Powder River Basin

Powder River at Salisbury, Oreg.

Location.— Lat. 44°39', long. 117°52', in NE $\frac{1}{4}$  sec. 36, T. 10 S., R. 39 E., 700 feet downstream from Salisbury siding of Sumpter Valley Railroad and Stices Gulch and  $\frac{8}{16}$  miles south of Baker. Datum of gage is 3,633.31 feet above mean sea level, datum of 1929.

Drainage area.— 230 square miles.

Gage-height record.— Water-stage recorder graph.

Discharge record.— Stage-discharge relation defined by current-meter measurements below 750 second-foot and extended to peak stage.

Maxima.— May-June 1948: Discharge, 1,200 second-feet 3 p.m. May 28 (gage height, 6.26 feet).

1903-14, 1926 to April 1948: Discharge, 1,820 second-feet Mar. 20, 1910 (gage height, 7.05 feet, site and datum then in use).

Remarks.— Diversions above station for irrigation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	253	571	129	11	294	705	80	21	535	325	54
2	225	615	121	12	267	589	74	22	590	294	53
3	239	673	112	13	263	500	68	23	629	271	49
4	282	725	103	14	267	435	68	24	638	239	47
5	267	715	105	15	273	402	68	25	686	207	44
6	269	716	107	16	292	372	64	26	748	191	43
7	357	722	111	17	380	330	62	27	864	159	39
8	384	833	103	18	460	328	56	28	1,040	125	41
9	366	908	96	19	522	374	54	29	939	136	42
10	327	817	84	20	526	331	54	30	698	134	43
								31	608		42
Monthly mean discharge, in second-feet									467	458	71.5
Runoff, in inches									2.34	2.22	0.36

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4			3.70	445	3.98	514	4.02	524	4.01	522	4.25	584
8	3.35	364	3.73	452	4.02	524	4.04	529	4.02	524	4.27	590
N			3.77	462	4.03	527	4.05	532	4.04	529	4.29	595
4	3.51	400	3.77	462	4.04	529	4.05	532	4.07	537	4.29	595
8			3.82	474	4.04	529	4.01	522	4.14	555	4.28	593
12	3.64	431	3.94	504	4.00	519	3.99	516	4.21	574	4.29	595
	May 23		May 24		May 25		May 26		May 27		May 28	
4	4.36	614	4.40	625	4.54	664	4.76	728	5.06	818	5.51	953
8	4.41	628	4.42	631	4.56	670	4.80	740	5.16	848	5.57	971
N	4.44	636	4.45	639	4.61	684	4.82	746	5.23	869	5.65	995
4	4.45	639	4.48	647	4.69	707	4.86	758	5.29	887	5.62	1,190
8	4.46	642	4.47	645	4.69	707	4.87	761	5.34	902	5.97	1,100
12	4.42	631	4.51	656	4.71	713	4.99	797	5.41	923	5.77	1,030
	May 29		May 30		May 31		June 1		June 2		June 3	
4	5.58	990	4.70	744	4.24	620	4.06	573	4.03	565	4.28	631
8	5.50	968	4.58	712	4.23	617	4.08	578	4.17	601	4.35	650
N	5.50	968	4.50	690	4.21	612	4.10	583	4.27	628	4.44	674
4	5.40	940	4.44	674	4.17	601	4.04	567	4.34	647	4.55	704
8	5.11	859	4.35	650	4.11	586	4.00	557	4.35	650	4.57	709
12	4.91	803	4.31	639	4.09	580	4.01	560	4.29	633	4.57	709
	June 4		June 5		June 6		June 7		June 8		June 9	
4	4.59	714	4.54	701	4.57	709	4.52	695	4.69	741	5.35	926
8	4.58	712	4.58	712	4.61	720	4.63	725	5.03	836	5.46	957
N	4.66	733	4.60	717	4.67	736	4.69	741	5.19	881	5.41	943
4	4.68	739	4.59	714	4.64	728	4.72	750	5.12	862	5.22	890
8	4.65	730	4.60	717	4.56	706	4.62	722	5.13	864	5.08	850
12	4.66	733	4.58	712	4.48	685	4.57	709	5.29	909	5.04	839
	June 10		June 11		June 12		June 13		June 14		June 15	
4	4.94	811	4.68	739	4.23	617	3.87	523	3.59	452	3.38	401
8	4.94	811	4.63	725	4.17	601	3.85	518	3.59	452	3.39	404
N	5.04	839	4.58	712	4.14	593	3.82	510	3.57	448	3.41	408
4	4.98	822	4.49	687	4.08	578	3.74	490	3.51	432	3.38	401
8	4.98	822	4.37	655	4.00	557	3.64	365	3.38	401	3.41	408
12	4.84	783	4.31	639	3.91	534	3.60	455	3.37	399	3.28	377
	June 16		June 17		June 18		June 19		June 20		June 21	
4	3.29	380	3.13	342	2.99	310	3.33	389	3.08	330	3.03	319
8	3.32	397	3.12	340	3.03	319	3.31	384	3.07	328	3.07	328
N	3.30	382	3.11	337	3.07	328	3.29	380	3.07	328	3.10	335
4	3.26	372	3.05	324	3.08	330	3.25	370	3.11	337	3.09	333
8	3.17	351	3.00	312	3.11	337	3.19	356	3.09	333	3.06	326
12	3.13	342	2.98	307	3.30	382	3.11	337	3.04	321	3.00	312

Supplemental record.— May 28, 3 p.m. 6.26 ft., 1,200 sec.-ft.; May 29, 10 a.m., 5.46 ft., 957 sec.-ft.; June 5, 5 p.m., 4.66 ft., 733 sec.-ft.; June 8, 11 a.m., 5.20 ft., 884 sec.-ft.; June 9, 9 a.m., 5.50 ft., 968 sec.-ft.; June 10, 6 a.m., 4.92 ft., 806 sec.-ft., 6 p.m. 4.90 ft., 800 sec.-ft.; June 19, 2 a.m., 3.54 ft., 392 sec.-ft.; June 21, 10 p.m., 2.96 ft., 303 sec.-ft.

## Powder River near Haines, Oreg.

Location.- Lat. 44°56', long. 117°57', in S $\frac{1}{2}$  sec. 21, T. 7 S., R. 39 E., a tenth of a mile upstream from Muddy Creek, 1 mile downstream from Rock Creek, and 1.7 miles north of Haines.

Drainage area.- 572 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge, 1,300 second-feet 10 p.m. June 8 to 1 a.m. June 9 (gage height, 6.67 feet).

1946 to April 1948: Discharge, 468 second-feet Apr. 24, 1948 (gage height, 3.80 feet).

Remarks.- Many diversions above station for irrigation; no seasonal regulation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July	
1	333	1,030	46	11	393	1,090	21	21	511	513	7.5	
2	304	939	36	12	363	998	18	22	592	467	7.5	
3	280	911	33	13	350	917	18	23	670	411	7.5	
4	312	991	32	14	314	818	16	24	681	365	9.5	
5	341	974	36	15	293	708	13	25	714	301	9.1	
6	333	1,010	35	16	279	605	13	26	768	252	9.5	
7	321	1,020	32	17	256	549	11	27	876	207	11	
8	343	1,190	31	18	262	496	7.1	28	968	167	13	
9	390	1,250	25	19	375	507	5.9	29	1,080	120	15	
10	408	1,200	23	20	455	498	7.9	30	1,180	68	13	
								31	1,120		14	
Monthly mean discharge, in second-feet.....										512	686	18.6
Runoff, in inches.....										1.03	1.34	0.04

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	2.66	271	2.47	242	3.02	329	3.61	433	4.01	508	4.25	555
8	2.66	271	2.55	254	3.18	357	3.67	444	4.05	516	4.33	571
N	2.65	269	2.62	264	3.33	382	3.72	453	4.05	516	4.42	589
4	2.51	248	2.64	267	3.47	408	3.79	466	4.01	508	4.51	607
8	2.38	229	2.74	283	3.49	411	3.85	478	4.02	510	4.65	635
12	2.36	225	2.84	299	3.55	422	3.92	491	4.11	527	4.77	659
	May 23		May 24		May 25		May 26		May 27		May 28	
4	4.81	668	4.86	680	4.94	700	5.12	745	5.46	830	5.83	939
8	4.83	672	4.88	685	4.98	710	5.20	765	5.62	876	5.90	960
N	4.84	675	4.88	685	5.00	715	5.27	782	5.70	900	5.96	984
4	4.81	668	4.85	678	5.03	722	5.25	778	5.71	903	5.96	984
8	4.80	665	4.85	678	5.04	725	5.23	772	5.68	894	5.97	988
12	4.84	675	4.89	688	5.08	735	5.31	792	5.75	915	5.98	992
	May 29		May 30		May 31		June 1		June 2		June 3	
4	6.01	1,000	6.53	1,220	6.38	1,150	6.18	1,060	5.96	974	5.73	899
8	6.14	1,060	6.48	1,200	6.37	1,140	6.15	1,050	5.92	958	5.72	896
N	6.24	1,100	6.44	1,180	6.34	1,130	6.11	1,030	5.87	941	5.73	899
4	6.29	1,120	6.41	1,160	6.29	1,110	6.05	1,010	5.81	923	5.74	902
8	6.33	1,130	6.40	1,160	6.24	1,090	5.99	986	5.74	902	5.86	938
12	6.41	1,160	6.39	1,160	6.21	1,070	5.96	974	5.72	896	5.94	966
	June 4		June 5		June 6		June 7		June 8		June 9	
4	6.01	994	5.97	978	6.07	1,020	6.11	1,030	6.25	1,090	6.65	1,280
8	6.05	1,010	5.98	982	6.09	1,030	6.12	1,040	6.38	1,150	6.62	1,270
N	6.06	1,010	5.98	982	6.06	1,010	6.09	1,030	6.50	1,210	6.59	1,260
4	6.01	994	5.93	962	6.02	998	6.03	1,000	6.63	1,280	6.53	1,220
8	5.95	970	5.93	962	6.00	990	5.99	986	6.66	1,290	6.49	1,200
12	5.95	970	6.00	990	6.06	1,010	6.02	998	6.67	1,300	6.52	1,220
	June 10		June 11		June 12		June 13		June 14		June 15	
4	6.56	1,240	6.31	1,120	6.10	1,030	5.90	950	5.60	860	5.20	750
8	6.56	1,240	6.30	1,110	6.06	1,010	5.86	938	5.54	842	5.13	732
N	6.52	1,220	6.28	1,100	6.02	998	5.81	923	5.46	818	5.05	712
4	6.46	1,190	6.23	1,080	5.98	982	5.73	899	5.38	795	4.94	685
8	6.36	1,140	6.17	1,060	5.95	970	5.66	878	5.30	775	4.86	665
12	6.32	1,120	6.15	1,040	5.92	958	5.63	869	5.25	762	4.80	650
	June 16		June 17		June 18		June 19		June 20		June 21	
4	4.73	636	4.32	554	4.13	516	4.11	512	4.00	490	4.15	520
8	4.67	624	4.34	558	4.04	498	4.13	516	3.99	488	4.15	520
N	4.61	612	4.35	560	3.98	486	4.12	514	4.02	494	4.14	518
4	4.52	594	4.29	548	3.91	474	4.09	508	4.07	504	4.12	514
8	4.36	562	4.22	534	3.93	488	4.03	496	4.09	508	4.06	502
12	4.32	554	4.17	524	4.05	500	4.02	494	4.12	514	4.02	494

## Powder River near Robinette, Oreg.

Location.- Lat. 44°46', long. 117°04', in SE<sup>1</sup> sec. 22, T. 9 S., R. 46 E., downstream from all tributaries, 2 miles northwest of Robinette and 2½ miles upstream from mouth.

Drainage area.- 1,710 square miles.

Gage-height record.- Staff gage read twice daily.

Maxima.- May-June 1948: Discharge, 5,320 second-feet May 28 (gage height, 6.6 feet, from floodmark).

1928 to April 1948: Discharge observed, 4,180 second-feet June 15, 16, 1933 (gage height, 6.90 feet, site and datum then in use).

Remarks.- Many diversions above station for irrigation. Some seasonal storage in several reservoirs, the largest being Thief Valley Reservoir near North Powder (capacity, 17,400 acre-feet at spillway level).

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,360	4,010	1,060	11	1,580	4,500	474	21	2,630	2,070	302
2	1,260	4,080	950	12	1,470	4,080	462	22	2,740	1,920	299
3	1,230	4,150	800	13	1,440	3,480	410	23	2,800	1,920	273
4	1,400	4,080	725	14	1,480	3,110	383	24	3,420	1,970	246
5	1,340	4,600	715	15	1,480	2,820	372	25	3,740	1,740	246
6	1,360	4,640	635	16	1,580	2,760	362	26	3,870	1,390	258
7	1,720	4,430	591	17	1,810	2,380	334	27	4,290	1,280	234
8	1,790	4,640	546	18	1,760	2,170	334	28	4,870	1,220	246
9	1,790	4,570	490	19	2,460	2,070	324	29	4,080	1,150	252
10	1,680	4,640	458	20	2,520	2,120	327	30	4,010	1,130	225
								31	3,780		204
Monthly mean discharge, in second-feet.....									2,346	2,971	437
Runoff, in inches.....									1.58	1.94	0.29

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
	May 17			May 26			June 4			June 13	
5:20a	3.90	1,900	5a	5.70	4,010	5a	5.80	4,150	5:10a	5.50	3,740
8p	3.70	1,720	7:20p	5.50	3,740	7:30p	5.70	4,010	8:50p	5.10	3,230
	May 18			May 27			June 5			June 14	
5:15a	3.80	1,810	4:40a	6.10	4,570	4:40a	6.20	4,720	5a	5.10	3,230
6:40p	3.70	1,720	6:40p	6.70	4,010	7:30p	6.05	4,500	7:55p	4.90	2,990
	May 19			May 28			June 6			June 15	
5:15a	4.40	2,410	4:50a	6.50	5,170	4:30a	6.40	5,020	5:10a	4.90	2,990
6:30p	4.50	2,520	6:50p	6.10	4,570	7:40p	5.90	4,290	8p	4.60	2,650
	May 20			May 29			June 7			June 16	
5:10a	4.60	2,630	4:40a	5.80	4,150	4:45a	6.20	4,720	5:20a	4.90	2,990
7:10p	4.40	2,410	7p	5.70	4,010	7:10p	5.80	4,150	7:20p	4.50	2,540
	May 21			May 30			June 8			June 17	
5a	4.70	2,740	5a	5.70	4,010	4:50a	6.10	4,570	5:10a	4.50	2,540
6:30p	4.50	2,520	6:10p	5.70	4,010	8:10p	6.20	4,720	7:40p	4.20	2,220
	May 22			May 31			June 9			June 18	
5:30a	4.80	2,860	4:40a	5.60	3,870	4:40a	6.30	4,870	5:30a	4.20	2,220
6:30p	4.60	2,630	8:15p	5.46	3,690	7p	5.90	4,290	6:30p	4.10	2,120
	May 23			June 1			June 10			June 19	
5:10a	4.70	2,740	4:50a	5.80	4,150	4:55a	6.30	4,870	5:20a	4.10	2,120
7p	4.80	2,860	7:20p	5.60	3,870	8p	6.00	4,430	9:05p	4.00	2,020
	May 24			June 2			June 11			June 20	
5a	5.30	3,480	4:30a	5.90	4,290	4:50a	6.20	4,720	5a	4.10	2,120
8:10p	5.20	3,350	7:50p	5.60	3,870	7:50p	5.90	4,290	7:15p	4.10	2,120
	May 25			June 3			June 12			June 21	
5:10a	5.60	3,870	4:45a	6.00	4,430	5a	5.90	4,290	5:10a	4.10	2,120
6:40p	5.40	3,610	7:50p	5.60	3,870	8p	5.60	3,870	7:30p	4.00	2,020

## Wolf Creek near North Powder, Oreg.

Location.- Lat. 45°03', long. 118°01', in SE $\frac{1}{4}$  sec. 11, T. 6 S., R. 38 E., 5 miles northwest of North Powder.

Drainage area.- 32.9 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge, 433 second-feet 2 a.m. May 23 (gage height, 4.46 feet).

1913-14, 1946 to April 1948: Discharge observed, 260 second-feet Apr. 14, 1914 (gage height, 2.70 feet, site and datum then in use).

Remarks.- Many small diversions above station for irrigation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	87	140	21	11	110	71	12	21	301	68	5.6
2	82	133	20	12	105	60	11	22	363	62	5.1
3	95	156	18	13	129	55	6.2	23	368	55	5.3
4	115	166	18	14	142	51	4.8	24	328	44	6.2
5	111	143	18	15	152	41	5.9	25	316	38	5.6
6	134	127	16	16	194	37	5.3	26	333	33	5.6
7	177	111	15	17	253	37	5.1	27	347	31	6.6
8	163	106	14	18	290	45	5.3	28	296	28	6.9
9	139	98	13	19	294	62	5.9	29	220	25	6.9
10	124	80	12	20	297	61	5.9	30	174	23	6.2
								31	153		5.3
Monthly mean discharge, in second-feet.....									206	72.9	96.0
Runoff, in inches.....									7.22	2.47	0.34

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	3.55	238	3.66	301	3.79	286	3.85	298	3.90	309	4.00	330
8	3.55	238	3.82	292	3.77	282	3.80	288	3.85	298	4.07	345
N	3.57	242	3.77	282	3.76	280	3.75	278	3.81	290	4.14	361
4	3.63	254	3.77	282	3.84	296	3.82	292	3.81	290	4.22	378
8	3.74	276	3.79	286	3.95	320	3.90	309	3.87	303	4.31	398
12	3.88	305	3.81	290	3.91	311	3.95	320	3.93	315	4.40	419
	May 23		May 24		May 25		May 26		May 27		May 28	
4	4.40	419	4.03	338	3.93	317	3.95	322	4.16	366	4.03	338
8	4.25	386	4.00	332	3.89	309	3.90	311	4.06	345	3.94	319
N	4.12	357	3.96	324	3.87	305	3.86	303	3.98	328	3.76	383
4	4.00	332	3.94	319	3.90	311	4.00	332	3.98	328	3.70	271
8	3.98	328	3.95	322	3.96	324	4.20	375	4.10	353	3.66	263
12	4.01	334	3.97	326	4.00	332	4.22	379	4.08	349	3.60	252
	May 29		May 30		May 31		June 1		June 2		June 3	
4	3.55	242	3.24	185	3.09	158	3.00	143	2.96	136	2.93	131
8	3.49	231	3.20	178	3.07	155	2.98	140	2.92	129	2.91	128
N	3.42	218	3.17	173	3.06	153	2.97	138	2.91	128	2.91	128
4	3.37	209	3.14	167	3.05	152	2.96	136	2.91	128	3.10	160
8	3.32	200	3.12	164	3.03	148	2.99	141	2.96	136	3.43	220
12	3.29	194	3.11	162	3.01	145	2.99	141	2.96	136	3.31	198
	June 4		June 5		June 6		June 7		June 8		June 9	
4	3.20	178	3.04	150	2.94	133	2.85	118	2.79	108	2.73	99
8	3.15	169	3.01	145	2.91	128	2.83	115	2.76	104	2.70	94
N	3.10	160	2.97	138	2.89	124	2.78	107	2.75	102	2.67	90
4	3.08	157	2.96	136	2.86	120	2.76	104	2.72	97	2.76	104
8	3.08	157	2.99	141	2.89	124	2.78	107	2.86	120	2.74	100
12	3.06	153	2.97	138	2.88	123	2.78	107	2.77	105	2.69	92
	June 10		June 11		June 12		June 13		June 14		June 15	
4	2.63	84	2.53	69	2.47	61	2.40	52	2.40	52	2.33	44
N	2.56	73	2.56	73	2.43	56	2.45	58	2.36	48	2.25	36
4	2.57	75	2.52	68	2.42	55	2.44	57	2.38	50	2.27	38
8												
12												
	June 16		June 17		June 18		June 19		June 20		June 21	
4	2.23	35	2.25	36	2.28	39	2.50	65	2.42	55	2.54	71
N	2.26	37	2.24	36	2.32	43	2.45	58	2.50	65	2.50	65
4												
8												
12	2.27	38	2.29	40	2.51	66	2.42	55	2.55	72	2.50	65

Supplemental record.- May 23, 2 a.m., 4.46 ft., 433 sec.-ft.; June 19, 3 a.m., 2.55 ft., 72 sec.-ft.

## Immaha River Basin

Immaha River above Gumboot Creek, Oreg.

Location.- Lat. 45°11', long. 116°53', in sec. 30 or 31, T. 4 S., R. 48 E., 0.1 mile upstream from Gumboot Creek and 5 miles northeast of Coverdale forest guard station.

Drainage area.- 98 square miles.

Gage-height record.- Water-stage recorder graph except for period 2 a.m. May 23 to noon May 25, for which graph was reconstructed on basis of recorded range in stage and normal daily pattern.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 1,620 second-feet and extended to peak stage.

Maxima.- May-June 1948: Discharge, 2,400 second-feet 11 p.m. May 27 (gage height, 5.07 feet).

1944 to April 1948: Discharge, 1,540 second-feet May 8, 1946 (gage height, 3.97 feet).

Remarks.- No regulation or diversion above station.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	370	1,340	794	11	391	1,570	463	21	1,040	890	300
2	339	1,520	688	12	406	1,310	444	22	1,080	833	288
3	342	1,670	633	13	455	1,220	413	23	1,050	822	285
4	362	1,520	590	14	471	1,190	391	24	1,230	833	273
5	352	1,610	577	15	497	1,290	373	25	1,480	811	258
6	432	1,740	527	16	624	1,230	359	26	1,650	772	244
7	549	1,760	523	17	821	1,070	345	27	1,880	778	238
8	476	1,920	484	18	850	1,030	349	28	1,840	806	236
9	424	1,890	459	19	976	1,020	349	29	1,390	822	222
10	398	1,730	455	20	976	976	319	30	1,220	850	212
								31	1,220		204
Monthly mean discharge, in second-feet .....									826	1,227	397
Runoff, in inches .....									9.71	13.97	4.67

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	3.14	822	3.22	867	3.40	975	3.41	982	3.49	1,030	3.66	1,150
8	3.08	789	3.16	833	3.40	975	3.33	933	3.41	982	3.57	1,090
N	3.04	767	3.10	800	3.35	945	3.25	885	3.35	945	3.49	1,030
4	3.13	816	3.11	806	3.37	957	3.30	915	3.38	963	3.45	1,010
8	3.22	867	3.26	891	3.47	1,020	3.54	1,070	3.65	1,140	3.52	1,050
12	3.25	885	3.32	927	3.50	1,040	3.59	1,100	3.75	1,220	3.54	1,070
	May 23		May 24		May 25		May 26		May 27		May 28	
4	3.46	1,010	3.71	1,190	4.01	1,420	4.29	1,650	4.47	1,810	4.80	2,130
8	3.39	969	3.60	1,110	3.87	1,310	4.13	1,510	4.33	1,690	4.60	1,930
N	3.34	959	3.52	1,050	3.82	1,270	4.02	1,430	4.22	1,590	4.40	1,750
4	3.45	1,010	3.65	1,140	4.02	1,430	4.18	1,550	4.42	1,770	4.29	1,650
8	3.75	1,220	4.10	1,490	4.44	1,790	4.58	1,910	4.93	2,260	4.24	1,610
12	3.85	1,290	4.15	1,530	4.42	1,770	4.64	1,970	5.05	2,380	4.17	1,550
	May 29		May 30		May 31		June 1		June 2		June 3	
4	4.10	1,490	3.81	1,260	3.75	1,220	3.90	1,330	4.12	1,510	4.47	1,810
8	4.01	1,420	3.72	1,190	3.65	1,140	3.79	1,240	4.00	1,410	4.38	1,730
N	3.93	1,350	3.64	1,140	3.58	1,100	3.68	1,170	3.88	1,310	4.26	1,620
4	3.87	1,310	3.68	1,170	3.65	1,140	3.81	1,260	4.02	1,430	4.20	1,570
8	3.92	1,350	3.82	1,270	3.95	1,370	4.14	1,520	4.37	1,720	4.21	1,580
12	3.90	1,330	3.84	1,280	4.00	1,410	4.25	1,620	4.43	1,780	4.23	1,600
	June 4		June 5		June 6		June 7		June 8		June 9	
4	4.18	1,550	4.23	1,600	4.43	1,780	4.47	1,810	4.56	1,890	4.64	1,970
8	4.10	1,490	4.12	1,510	4.27	1,630	4.30	1,660	4.46	1,800	4.43	1,780
N	4.00	1,410	4.00	1,410	4.14	1,520	4.16	1,540	4.41	1,760	4.26	1,620
4	4.02	1,430	4.08	1,470	4.20	1,570	4.25	1,620	4.47	1,810	4.35	1,700
8	4.25	1,620	4.49	1,830	4.61	1,940	4.58	1,910	4.81	2,140	4.76	2,090
12	4.33	1,690	4.61	1,940	4.70	2,030	4.66	1,990	4.89	2,220	4.79	2,120
	June 10		June 11		June 12		June 13		June 14		June 15	
4	4.56	1,890	4.40	1,750	3.99	1,400	3.81	1,260	3.75	1,220	3.88	1,310
8	4.37	1,720	4.24	1,610	3.87	1,310	3.70	1,180	3.65	1,140	3.84	1,280
N	4.24	1,610	4.10	1,490	3.76	1,220	3.62	1,120	3.59	1,100	3.74	1,210
4	4.16	1,540	4.02	1,430	3.72	1,190	3.65	1,140	3.61	1,120	3.72	1,190
8	4.30	1,660	4.10	1,490	3.90	1,330	3.85	1,290	3.86	1,300	3.95	1,370
12	4.43	1,780	4.10	1,490	3.91	1,340	3.85	1,290	3.84	1,280	4.06	1,460
	June 16		June 17		June 18		June 19		June 20		June 21	
4	3.91	1,340	3.62	1,120	3.50	1,040	3.54	1,070	3.45	1,010	3.31	921
8	3.77	1,230	3.54	1,070	3.43	994	3.46	1,010	3.37	957	3.26	891
N	3.66	1,150	3.46	1,010	3.37	957	3.40	975	3.34	939	3.21	861
4	3.66	1,150	3.44	1,000	3.38	963	3.38	963	3.39	969	3.19	850
8	3.73	1,200	3.54	1,070	3.59	1,100	3.50	1,040	3.40	975	3.27	897
12	3.71	1,190	3.57	1,090	3.62	1,120	3.53	1,060	3.37	957	3.24	879

Supplemental record.- May 27, 11 p.m., 5.07 ft., 2,400 sec.-ft.; June 2, 10 p.m., 4.48 ft., 1,820 sec.-ft.; June 3, 2 a.m., 4.50 ft., 1,840 sec.-ft.

Note.- Trough occurs daily at about 2 p.m. and crest about 10 p.m.



## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

Imnaha River at Imnaha, Oreg.

Location.- Lat. 45°34', long. 116°51', in SW $\frac{1}{4}$  sec. 16, T. 1 N., R. 48 E., at Imnaha,

Three-eighths of a mile downstream from Sheep Creek.

Drainage area.- 705 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 3,700 second-feet. Shifting-control method used May 16 to June 20.

Maxima.- May-June 1948: Discharge, 5,700 second-feet 4 a.m. May 28 (gage height, 7.06 feet).

1928 to April 1948: Discharge, 5,400 second-feet May 23, 1942 (gage height, 6.70 feet), from rating curve extended above 1,800 second-feet.

Remarks.- Diversions above station for irrigation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,650	2,940	1,500	11	2,360	2,820	810	21	3,320	2,000	496
2	1,480	3,130	1,350	12	2,320	2,540	788	22	3,460	1,960	473
3	1,430	3,530	1,200	13	2,550	2,440	742	23	3,330	1,910	450
4	1,570	3,220	1,120	14	2,570	2,340	685	24	3,690	1,850	434
5	1,550	3,140	1,080	15	2,460	2,410	637	25	4,060	1,800	423
6	1,700	3,270	1,010	16	2,770	2,410	592	26	4,250	1,680	397
7	2,490	3,250	958	17	3,500	2,210	555	27	4,410	1,600	386
8	2,420	3,340	902	18	3,140	2,100	561	28	4,580	1,590	407
9	2,240	3,320	832	19	3,400	2,140	555	29	3,430	1,560	381
10	2,200	3,090	810	20	3,380	2,070	549	30	2,890	1,560	356
								31	2,800		337
Monthly mean discharge, in second-feet									2,813	2,441	702
Runoff, in inches									4.60	3.86	1.15

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	5.97	3,510	5.80	3,280	5.83	3,320	6.07	3,720	5.94	3,540	6.02	3,660
8	5.84	3,330	5.72	3,180	5.88	3,400	5.90	3,780	5.81	3,360	5.92	3,540
N	5.71	3,160	5.63	3,060	5.90	3,440	5.70	3,220	5.69	3,200	5.83	3,410
4	5.67	3,110	5.61	3,030	5.83	3,360	5.61	3,100	5.65	3,150	5.79	3,370
8	5.76	3,230	5.63	3,060	5.89	3,450	5.68	3,190	5.70	3,220	5.79	3,380
12	5.82	3,310	5.74	3,200	6.03	3,660	5.90	3,480	5.84	3,400	5.83	3,450
	May 23		May 24		May 25		May 26		May 27		May 28	
4	5.84	3,470	6.13	3,910	6.37	4,380	6.47	4,640	6.59	4,880	7.06	5,700
8	5.75	3,340	5.95	3,680	6.14	4,080	6.29	4,380	6.32	4,490	6.60	5,000
N	5.63	3,200	5.79	3,470	5.94	3,830	6.05	4,040	6.04	4,100	6.16	4,340
4	5.54	3,080	5.69	3,340	5.84	3,700	5.92	3,860	5.91	3,930	5.98	4,080
8	5.67	3,270	5.95	3,730	6.06	4,030	6.05	4,050	6.07	4,180	5.83	3,890
12	6.05	3,790	6.28	4,220	6.34	4,440	6.40	4,580	6.75	5,210	5.73	3,760
	May 29		May 30		May 31		June 1		June 2		June 3	
4	5.67	3,690	5.12	3,020	5.02	2,960	5.07	3,100	5.27	3,370	5.51	3,660
8	5.57	3,560	5.05	2,940	4.91	2,820	5.00	3,020	5.12	3,180	5.55	3,700
N	5.49	3,470	4.98	2,860	4.80	2,700	4.86	2,840	5.01	3,030	5.50	3,620
4	5.32	3,250	4.87	2,720	4.75	2,650	4.81	2,770	4.90	2,890	5.38	3,450
8	5.24	3,160	4.89	2,750	4.79	2,710	4.85	2,820	4.98	2,980	5.31	3,360
12	5.21	3,140	5.03	2,960	5.02	3,020	5.12	3,180	5.34	3,440	5.29	3,330
	June 4		June 5		June 6		June 7		June 8		June 9	
4	5.36	3,420	5.29	3,330	5.50	3,620	5.50	3,620	5.43	3,520	5.59	3,750
8	5.29	3,330	5.20	3,220	5.37	3,440	5.33	3,380	5.37	3,440	5.42	3,510
N	5.18	3,190	5.10	3,080	5.19	3,200	5.17	3,180	5.25	3,280	5.19	3,200
4	5.10	3,080	4.99	2,940	5.00	2,960	5.01	2,970	5.15	3,150	5.02	2,980
8	5.07	3,050	5.00	2,960	5.04	3,010	5.00	2,960	5.19	3,200	5.02	2,970
12	5.19	3,190	5.33	3,380	5.38	3,450	5.29	3,330	5.47	3,580	5.36	3,400
	June 10		June 11		June 12		June 13		June 14		June 15	
4	5.49	3,560	5.06	2,970	4.86	2,710	4.71	2,530	4.66	2,470	4.69	2,510
8	5.32	3,320	5.07	2,980	4.78	2,620	4.66	2,470	4.60	2,400	4.64	2,450
N	5.09	3,010	4.92	2,790	4.70	2,520	4.63	2,440	4.52	2,300	4.61	2,410
4	4.95	2,820	4.86	2,710	4.63	2,440	4.58	2,380	4.45	2,220	4.52	2,300
8	4.97	2,720	4.83	2,680	4.58	2,380	4.56	2,350	4.44	2,210	4.56	2,350
12	4.95	2,820	4.86	2,710	4.67	2,480	4.66	2,470	4.57	2,360	4.71	2,630
	June 16		June 17		June 18		June 19		June 20		June 21	
4	4.76	2,590	4.54	2,330	4.41	2,170	4.48	2,220	4.43	2,140	4.41	2,070
8	4.67	2,480	4.49	2,270	4.37	2,130	4.43	2,150	4.38	2,080	4.38	2,030
N	4.58	2,380	4.42	2,180	4.33	2,080	4.41	2,120	4.34	2,040	4.34	1,980
4	4.51	2,290	4.37	2,130	4.28	2,030	4.41	2,120	4.32	2,010	4.30	1,940
8	4.50	2,280	4.34	2,090	4.29	2,030	4.40	2,100	4.38	2,060	4.29	1,930
12	4.55	2,340	4.38	2,140	4.41	2,150	4.41	2,120	4.42	2,090	4.34	1,980

## Salmon River Basin

## Salmon River near Obsidian, Idaho

Location.- Lat. 43°58', long. 114°48', in sec. 3, T. 7 N., R. 14 E., three-eighths of a mile below irrigation diversion dam, 1 mile upstream from Lost Creek, and 2½ miles southeast of Obsidian.

Drainage area.- 94.7 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 520 second-feet and extended to peak stage. Shifting-control method used May 1-18, June 27 to July 31.

Maxima.- May-June 1948: Discharge, 706 second-feet 9 a.m. June 3 (gage height, 4.22 feet).

1940 to April 1948: Discharge, 664 second-feet May 30, 1943 (gage height, 4.18 feet); gage height recorded, 4.74 feet sometime between Dec. 5, 1940, and Jan. 23, 1941 (ice jam).

Remarks.- Several diversions above station for irrigation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	41	445	171	11	68	513	63	21	301	315	28
2	40	507	160	12	84	463	60	22	266	276	21
3	42	625	155	13	105	494	59	23	262	240	19
4	41	541	151	14	105	443	57	24	325	228	18
5	40	512	119	15	128	424	44	25	394	222	18
6	61	507	101	16	168	396	34	26	457	208	17
7	99	533	98	17	211	347	32	27	499	200	17
8	81	520	85	18	258	321	31	28	571	188	17
9	67	547	70	19	340	299	30	29	559	178	17
10	63	514	66	20	294	287	29	30	458	180	16
								31	404		15
Monthly mean discharge, in second-feet .....									220	382	58.6
Runoff, in inches .....									2.68	4.51	0.71

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	2.90	180	3.18	256	3.44	343	3.30	292				
8	2.85	168	3.10	231	3.48	358	3.23	269	3.33	303		
N	2.83	164	3.06	220	3.45	347	3.21	262	3.28	285		250
4	3.04	217	3.12	237	3.43	339	3.26	279	3.27	282	3.17	250
8	3.28	292	3.30	296	3.42	336	3.40	328			3.25	276
12	3.29	296	3.37	321	3.36	314	3.46	351	3.30	292	3.23	269
	May 23		May 24		May 25		May 26		May 27		May 28	
4	3.18	253	3.38	321	3.59	403	3.81	500	3.87	528	3.99	586
8	3.13	237	3.32	299	3.52	374	3.74	468	3.83	509	3.98	581
N	3.11	231	3.27	282	3.47	355	3.63	420	3.76	477	3.93	557
4	3.15	244	3.31	296	3.47	355	3.60	407	3.70	450	3.90	542
8	3.33	303	3.49	362	3.64	424	3.70	450	3.80	495	3.96	571
12	3.43	339	3.62	416	3.78	486	3.83	509	3.94	562	4.05	616
	May 29		May 30		May 31		June 1		June 2		June 3	
4	4.05	616	3.81	500	3.61	411	3.73	464	3.85	518	4.11	647
8	4.01	596	3.77	482	3.60	407					4.20	695
N	3.93	557	3.70	450	3.58	399	3.65	428	3.81	500	4.15	668
4	3.86	523	3.65	428	3.51	370	3.62	416	3.76	477	4.02	601
8	3.82	504			3.58	399	3.68	441	3.81	500	3.95	566
12	3.82	504	3.63	420	3.70	450	3.80	495	3.97	576	3.95	566
	June 4		June 5		June 6		June 7		June 8		June 9	
4	3.97	576	3.90	542	3.89	537	3.97	576	3.88	532	4.00	591
8			3.87	528	3.86	523	3.91	547			3.95	566
N	3.90	542	3.82	504	3.80	495	3.88	532	3.85	518	3.89	537
4	3.84	514	3.76	477	3.73	464	3.82	504	3.80	495	3.85	518
8	3.82	504	3.78	486	3.78	486	3.83	509	3.82	504	3.85	518
12	3.88	532	3.88	532	3.89	537	3.87	528	3.95	566	3.90	542
	June 10		June 11		June 12		June 13		June 14		June 15	
4	3.92	552	3.93	557	3.81	500	3.83	509	3.76	477	3.72	459
8	3.88	532			3.77	482	3.89	537				
N	3.82	504	3.85	518	3.70	450						
4	3.76	477			3.65	428	3.75	472	3.61	411	3.56	391
8	3.78	486	3.73	464	3.65	428	3.72	459	3.63	420	3.60	407
12	3.85	518	3.81	500	3.77	482	3.76	477	3.69	446	3.66	433
	June 16		June 17		June 18		June 19		June 20		June 21	
4	3.64	424					3.33	303	3.29	289	3.32	299
8											3.35	310
N	3.55	386	3.46	351	3.36	314	3.28	285	3.24	272	3.38	321
4	3.52	374	3.38	321			3.28	285	3.28	285		
8					3.39	324	3.28	285	3.32	299	3.40	328
12	3.54	382	3.40	328	3.40	328	3.32	299	3.32	299	3.38	321

## Salmon River below Valley Creek, at Stanley, Idaho

Location.- Lat. 44°14', long. 114°55', in SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 34, T. 11 N., R. 13 E., three-quarters of a mile downstream from Valley Creek and  $1\frac{1}{2}$  miles northeast of Stanley.

Datum of gage is 6,190.32 feet above mean sea level, datum of 1929.

Drainage area.- 535 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 3,800 second-feet and extended to peak stage. Shifting-control method used May 1 to July 31.

Maxima.- May-June 1948: Discharge, 4,090 second-feet 1 to 4 p.m. June 9 (gage height, 3.91 feet).

1925 to April 1948: Discharge, 5,020 second-feet June 27, 1927 (gage height, 4.41 feet), from rating curve extended above 4,000 second-feet.

Remarks.- Diversions above station for irrigation.

## Mean discharge, in second-feet, 1948

mean discharge, in second-feet, 1945											
Day	May	June	July	Day	May	June	July	Day	May	June	July
1	687	2,880	1,730	11	902	3,700	1,040	21	2,130	2,360	721
2	654	3,120	1,720	12	980	3,460	1,010	22	2,050	2,260	696
3	730	3,770	1,660	13	1,180	3,560	980	23	1,940	2,010	670
4	791	3,840	1,590	14	1,170	3,400	940	24	1,980	1,870	646
5	738	3,600	1,430	15	1,160	3,130	892	25	2,240	1,820	630
6	930	3,570	1,320	16	1,290	2,930	845	26	2,560	1,770	605
7	1,190	3,670	1,250	17	1,430	2,700	800	27	2,860	1,690	589
8	960	3,790	1,200	18	1,720	2,470	791	28	3,260	1,650	581
9	836	3,990	1,120	19	2,150	2,360	764	29	3,680	1,610	565
10	854	3,900	1,060	20	2,090	2,190	746	30	3,410	1,620	533
								31	2,990		509
Monthly mean discharge, in second-feet.....									1,663	2,823	956
Runoff, in inches.....									3.58	5.89	2.06

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	2.16	1,430	2.45	1,780			2.78	2,220	2.78	2,220	2.70	2,110
8	2.09	1,360			2.75	2,180	2.70	2,110	2.78	2,220		
N	2.06	1,330	2.34	1,650	2.79	2,230	2.63	2,010			2.66	2,050
4	2.09	1,360	2.32	1,620			2.62	2,000	2.65	2,040	2.62	2,000
8					2.77	2,200	2.64	2,020	2.65	2,040		
12	2.40	1,710	2.54	1,890	2.79	2,230	2.71	2,120	2.69	2,030	2.62	2,000
	May 23		May 24		May 25		May 26		May 27		May 28	
4	2.64	2,020	2.65	2,020	2.78	2,200					3.33	3,050
8			2.65	2,020	2.85	2,270	3.04	2,580	3.22	2,880		
N	2.56	1,920			2.82	2,260	3.09	2,660	3.25	2,930	3.50	3,370
4	2.53	1,880	2.57	1,920	2.79	2,220	3.06	2,610				
8	2.54	1,890	2.60	1,960	2.81	2,250	3.04	2,580	3.24	2,910	3.50	3,370
12	2.59	1,960	2.69	2,080	2.88	2,340	3.06	2,610	3.27	2,960	3.55	3,470
	May 29		May 30		May 31		June 1		June 2		June 3	
4									3.29	2,950		
8												
N	3.71	3,790	3.54	3,430	3.31	3,000	3.27	2,910	3.42	3,180	3.78	3,870
4	3.71	3,790			3.22	2,880	3.25	2,880	3.43	3,200	3.82	3,950
8					3.22	2,840	3.25	2,880	3.43	3,200		
12	3.61	3,590	3.41	3,180	3.20	2,810	3.26	2,900	3.50	3,330	3.82	3,950
	June 4		June 5		June 6		June 7		June 8		June 9	
4	3.80	3,910	3.66	3,610	3.61	3,510	3.64	3,550	3.72	3,710	3.80	3,870
8												
N	3.78	3,870	3.67	3,630	3.68	3,650	3.74	3,750	3.79	3,850	3.90	4,070
4											3.91	4,090
12	3.69	3,690	3.62	3,530	3.62	3,530	3.72	3,710	3.77	3,810	3.86	3,990
	June 10		June 11		June 12		June 13		June 14		June 15	
4	3.84	3,950	3.72	3,710			3.59	3,450				
8							3.65	3,570				
N	3.84	3,950	3.75	3,770	3.62	3,510	3.66	3,590	3.58	3,430	3.44	3,160
4			3.72	3,710			3.71	3,690			3.40	3,090
8					3.52	3,310					3.37	3,030
12	3.73	3,730	3.65	3,570	3.53	3,330	3.63	3,530	3.47	3,220	3.35	3,000
	June 16		June 17		June 18		June 19		June 20		June 21	
4					3.02	2,450	3.03	2,460			2.87	2,230
8											2.93	2,320
N	3.32	2,950	3.19	2,720			2.96	2,360	2.84	2,190	2.97	2,380
4					3.03	2,460	2.92	2,300	2.82	2,160	3.01	2,440
8											3.04	2,480
12	3.25	2,830	3.06	2,510	3.05	2,500	2.86	2,220	2.84	2,190	3.02	2,450

## Salmon River below Yankee Fork, near Clayton, Idaho

Location.- Lat. 44°16', long. 114°44', in sec. 20, T. 11 N., R. 15 E., a quarter of a mile downstream from Yankee Fork and 18 miles upstream from Clayton.

Drainage area.- 841 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 5,800 second-feet and extended to peak stage.

Maxima.- May-June 1948: Discharge, 7,060 second-feet 10 p.m. June 3 (gage height, 9.27 feet).

1921 to April 1948: Discharge, 8,000 second-feet (estimated) June 27, 1927.

Remarks.- Small diversions above station for irrigation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	939	5,230	2,460	11	1,230	5,810	1,390	21	3,770	3,510	957
2	888	5,760	2,430	12	1,300	5,360	1,340	22	3,510	3,370	934
3	963	6,830	2,310	13	1,560	5,380	1,280	23	3,230	3,010	911
4	1,040	6,680	2,210	14	1,690	5,020	1,230	24	3,450	2,830	871
5	974	6,210	1,990	15	1,780	4,610	1,170	25	4,170	2,720	848
6	1,230	6,210	1,830	16	2,170	4,360	1,110	26	5,020	2,620	826
7	1,850	6,390	1,720	17	2,660	3,990	1,060	27	5,620	2,480	804
8	1,510	6,520	1,620	18	3,270	3,670	1,030	28	6,280	2,410	798
9	1,250	6,650	1,520	19	4,000	3,480	998	29	6,570	2,340	787
10	1,210	6,300	1,440	20	3,930	3,290	968	30	5,940	2,340	749
								31	5,190		727
Monthly mean discharge, in second-feet									2,845	4,513	1,301
Runoff, in inches									3.90	5.99	1.78

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	5.54	2,620	6.38	3,410	6.69	3,730	7.11	4,190	6.88	3,940	6.60	3,630
8	5.41	2,500	6.27	3,300	6.88	3,940	6.95	4,020	6.86	3,920	6.55	3,580
N	5.28	2,380	6.10	3,130	6.96	4,030	6.74	3,780	6.72	3,760	6.48	3,510
4	5.36	2,450	6.05	3,080	7.04	4,110	6.66	3,700	6.59	3,620	6.40	3,430
8	5.98	3,010	6.24	3,270	7.17	4,260	6.77	3,820	6.60	3,630	6.35	3,380
12	6.32	3,350	6.52	3,550	7.17	4,260	6.84	3,890	6.62	3,650	6.33	3,360
	May 23		May 24		May 25		May 26		May 27		May 28	
4	6.30	3,330	6.35	3,380	6.94	4,000	7.68	4,870	8.16	5,490	8.61	6,100
8	6.24	3,270	6.36	3,390	7.00	4,070	7.73	4,930	8.18	5,510	8.66	6,170
N	6.13	3,160	6.30	3,330	6.99	4,060	7.74	4,940	8.17	5,500	8.71	6,240
4	6.08	3,110	6.30	3,330	7.03	4,100	7.81	5,030	8.24	5,590	8.77	6,350
8	6.17	3,200	6.62	3,650	7.37	4,490	7.98	5,250	8.46	5,890	8.87	6,470
12	6.30	3,330	6.83	3,880	7.58	4,750	8.12	5,440	8.59	6,080	8.98	6,620
	May 29		May 30		May 31		June 1		June 2		June 3	
4	9.00	6,650			7.96	5,230					9.00	6,650
8	8.99	6,640	8.59	6,080	7.86	5,100	7.90	5,150	8.30	5,670	9.10	6,800
N	8.96	6,590			7.79	5,010	7.92	5,180	8.33	5,710	9.16	6,890
4	8.92	6,540	8.38	5,780	7.84	5,070	8.10	5,410	8.54	6,010	9.25	7,020
8	8.90	6,510			7.88	5,120	8.22	5,570	8.78	6,340	9.24	7,010
12	8.82	6,400	8.19	5,530								
	June 4		June 5		June 6		June 7		June 8		June 9	
4	9.17	6,900	8.75	6,300	8.69	6,220	8.79	6,360	8.87	6,470	9.00	6,650
8	9.09	6,780	8.68	6,200	8.65	6,160	8.77	6,330				
N	9.00	6,650	8.62	6,120	8.62	6,120	8.78	6,340	8.84	6,430	8.99	6,640
4	8.93	6,550	8.60	6,090	8.62	6,120	8.79	6,360	8.87	6,470		
8	8.89	6,500	8.69	6,220	8.77	6,330	8.88	6,480	9.00	6,650	9.01	6,660
12	8.84	6,430	8.72	6,260	8.82	6,400	8.92	6,540	9.04	6,710	8.97	6,610
	June 10		June 11		June 12		June 13		June 14		June 15	
4	8.85	6,440	8.50	5,950			8.12	5,440				
8	8.78	6,340	8.43	5,850	8.12	5,440	8.13	5,450	7.86	5,100		
N	8.72	6,260					8.09	5,400			7.45	4,590
4	8.68	6,200	8.35	5,740	7.98	5,250	8.07	5,370	7.72	4,920	7.39	4,520
8	8.68	6,200			7.93	5,190	8.07	5,370			7.40	4,530
12	8.61	6,100	8.27	5,630	7.93	5,190	7.99	5,270	7.61	4,780	7.41	4,540
	June 16		June 17		June 18		June 19		June 20		June 21	
4											6.32	3,350
8	7.30	4,410	6.99	4,060			6.51	3,540	6.28	3,310	6.43	3,460
N					6.58	3,610					6.51	3,540
4					6.60	3,630	6.37	3,400	6.20	3,230	6.54	3,570
8	7.21	4,300	6.87	3,930	6.65	3,680	6.33	3,360	6.22	3,250	6.63	3,660
12	7.12	4,200	6.72	3,760	6.64	3,670	6.35	3,380	6.28	3,210	6.61	3,640

Supplemental record.- June 3, 10 p.m., 9.27 ft., 7,060 sec.-ft.

## Salmon River near Challis, Idaho

Location.- Lat. 44°23', long. 114°15', in sec. 7, T. 12 N., R. 19 E., 250 feet downstream from Bayhorse Creek and 9 miles south of Challis. Datum of gage is 5,163.99 feet above mean sea level, datum of 1929.

Drainage area.- 1,800 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 8,400 second-feet and extended to peak stage.

Maxima.- May-June 1948: Discharge, 10,300 second-feet 3 to 5 p.m. June 3; gage height, 8.04 feet 3:30 p.m. June 3.

1928 to April 1948: Discharge, 10,500 second-feet May 30, 1943 (gage height, 8.07 feet).

Remarks.- Some diversion above station for irrigation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,320	7,280	3,740	11	1,580	8,690	2,240	21	4,890	5,050	1,580
2	1,200	8,060	3,730	12	1,620	7,870	2,180	22	4,790	4,990	1,540
3	1,240	9,790	3,490	13	1,840	7,690	2,100	23	4,430	4,490	1,500
4	1,350	9,610	3,350	14	2,110	7,320	2,010	24	4,670	4,240	1,440
5	1,270	8,800	3,060	15	2,130	6,640	1,910	25	5,800	4,110	1,390
6	1,420	8,820	2,810	16	2,550	6,270	1,840	26	7,160	3,950	1,340
7	2,180	9,170	2,640	17	3,180	5,800	1,770	27	7,790	3,780	1,290
8	2,130	9,380	2,510	18	4,210	5,230	1,710	28	8,830	3,680	1,270
9	1,740	9,750	2,380	19	4,840	5,010	1,670	29	9,280	3,640	1,260
10	1,630	9,160	2,280	20	5,090	4,790	1,620	30	8,220	3,620	1,220
								31	7,230		1,180
Monthly mean discharge, in second-feet .....									3,797	6,556	2,066
Runoff, in inches .....									2.43	4.06	1.32

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	4.81	3,080	5.50	4,240	5.61	4,450	6.08	5,420	5.88	4,990	5.81	4,840
8	4.99	3,860	5.65	4,520	5.75	4,720	6.05	5,350	5.90	5,030	5.85	4,920
N	4.95	3,300	5.61	4,450	5.84	4,900	5.95	5,140	5.89	5,010	5.84	4,900
4	4.87	3,180	5.47	4,190	5.91	5,050	5.83	4,680	5.82	4,860	5.79	4,800
8	4.82	3,100	5.39	4,040	5.96	5,160	5.73	4,680	5.74	4,700	5.72	4,660
12	5.07	3,490	5.45	4,150	6.07	5,390	5.79	4,800	5.74	4,700	5.68	4,580
	May 23		May 24		May 25		May 26		May 27		May 28	
4	5.68	4,580	5.68	4,580	6.14	5,550	6.80	7,090	7.11	7,840	7.44	8,670
8	5.64	4,510	5.75	4,720	6.27	5,850	6.90	7,330	7.13	7,900	7.50	8,830
N	5.61	4,450	5.76	4,740	6.31	5,940	6.90	7,330	7.09	7,800	7.58	9,040
4	5.56	4,350	5.74	4,700	6.30	5,920	6.83	7,160	7.05	7,700	7.55	8,960
8	5.50	4,240	5.69	4,600	6.28	5,870	6.84	7,190	7.07	7,740	7.47	8,750
12	5.55	4,340	5.87	4,970	6.50	6,380	6.91	7,350	7.26	8,220	7.65	9,220
	May 29		May 30		May 31		June 1		June 2		June 3	
4	7.73	9,440					6.87	7,260	7.13	7,900	7.63	9,170
8	7.78	9,580	7.33	8,400	6.93	7,400	6.88	7,280	7.18	8,020	7.80	9,640
N	7.74	9,470					6.87	7,260	7.19	8,040	7.93	10,000
4	7.64	9,200	7.17	8,000	6.74	6,950	6.87	7,260	7.20	8,070	8.03	10,300
8	7.56	8,990			6.73	6,920	6.88	7,280	7.25	8,200	8.01	10,200
12	7.50	8,830	7.06	7,720	6.79	7,070	7.01	7,600	7.43	8,650	7.98	10,200
	June 4		June 5		June 6		June 7		June 8		June 9	
4	7.95	10,100	7.58	9,040	7.54	8,930	7.66	9,250	7.75	9,500	7.91	9,950
8	7.88	9,860	7.53	8,910	7.56	8,990	7.68	9,310	7.74	9,470	7.33	10,000
N	7.80	9,640	7.46	8,730	7.49	8,800	7.65	9,220	7.71	9,390	7.88	9,860
4	7.67	9,280	7.41	8,600	7.45	8,700	7.60	9,090	7.65	9,220	7.79	9,610
8	7.62	9,140	7.42	8,620	7.44	8,670	7.60	9,090	7.66	9,250	7.75	9,500
12	7.60	9,090	7.47	8,750	7.52	8,880	7.67	9,280	7.79	9,610	7.77	9,560
	June 10		June 11		June 12		June 13		June 14		June 15	
4	7.77	9,560	7.60	9,090	7.25	8,200	6.99	7,550	7.02	7,620	6.71	6,870
8	7.69	9,330	7.56	8,990	7.20	8,070	7.10	7,820	6.98	7,520	6.67	6,780
N	7.62	9,140	7.45	8,700	7.15	7,940	7.13	7,900	6.92	7,380	6.62	6,660
4	7.53	8,910	7.38	8,520	7.05	7,700	7.08	7,770	6.83	7,160	6.56	6,520
8	7.47	8,750	7.28	8,270	6.97	7,500	7.01	7,600	6.77	7,020	6.50	6,380
12	7.55	8,960	7.25	8,200	6.96	7,470	7.00	7,570	6.72	6,900	6.49	6,360
	June 16		June 17		June 18		June 19		June 20		June 21	
4	6.54	6,470					6.00	5,240	5.83	4,880		
8	6.51	6,400	6.32	5,970	6.03	5,310	5.95	5,140	5.85	4,920	5.87	4,970
N	6.45	6,260									5.92	5,070
4			6.20	5,690	5.93	5,090	5.83	4,880	5.76	4,740	5.99	5,220
8							5.80	4,820	5.72	4,660		
12	6.35	6,040	6.08	5,420	5.97	5,180	5.78	4,780	5.72	4,660	6.03	5,310

## Salmon River at Salmon, Idaho

Location.- Lat. 45°11', long. 113°54', in sec. 6, T. 21 N., R. 22 E., just upstream from Lemhi River, near Rose ranch buildings, 1,000 feet downstream from island, and three-eighths of a mile downstream from highway bridge at Salmon.

Drainage area.- 3,760 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge, 10,900 second-feet 11 a.m. June 4 (gage height, 7.32 feet).

1912-16, 1919 to April 1948: Discharge observed, 16,400 second-feet June 12, 1921 (gage height, 9.35 feet, staff gage at site 700 feet upstream).

Remarks.- Diversions above station for irrigation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,820	8,660	4,460	11	2,090	9,540	2,850	21	5,970	6,270	2,080
2	1,630	8,930	4,620	12	2,050	9,140	2,870	22	5,840	6,680	2,000
3	1,510	9,770	4,510	13	2,090	8,720	2,730	23	5,420	6,070	1,920
4	1,560	10,800	4,350	14	2,390	8,490	2,620	24	5,200	5,700	1,850
5	1,630	10,200	4,090	15	2,510	7,880	2,500	25	5,820	5,450	1,780
6	1,540	9,750	3,820	16	2,660	7,360	2,390	26	7,080	5,250	1,730
7	1,940	9,840	3,510	17	3,270	7,040	2,280	27	8,280	4,990	1,690
8	2,820	9,950	3,310	18	4,270	6,510	2,240	28	9,320	4,760	1,630
9	2,510	10,100	3,180	19	5,150	6,230	2,190	29	10,300	4,600	1,620
10	2,210	10,000	2,970	20	6,140	5,950	2,130	30	10,200	4,940	1,600
								31	9,250	1,540	
Monthly mean discharge, in second-feet									4,358	7,637	2,679
Runoff, in inches									1.33	2.27	0.82

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	4.30	3,080	4.64	3,750	5.19	4,970	5.57	5,900	5.61	6,000	5.60	5,970
8	4.27	3,020	4.64	3,750	5.15	4,880	5.63	6,050	5.54	5,820	5.55	5,840
N	4.26	3,000	4.74	3,960	5.18	4,940	5.71	6,260	5.56	5,870	5.53	5,800
4	4.42	3,310	5.07	4,690	5.31	5,250	5.74	6,330	5.61	6,000	5.53	5,800
8	4.62	3,710	5.21	5,010	5.40	5,470	5.74	6,330	5.62	6,020	5.52	5,770
12	4.66	3,800	5.24	5,090	5.49	5,700	5.69	6,200	5.63	6,050	5.49	5,700
	May 23		May 24		May 25		May 26		May 27		May 28	
4	5.44	5,570	5.27	5,160	5.38	5,420	5.82	6,540	6.34	7,980	6.64	8,850
8	5.40	5,470	5.22	5,040	5.37	5,400	5.84	6,600	6.36	8,040	6.67	8,930
N	5.37	5,400	5.24	5,090	5.47	5,640	5.97	6,950	6.41	8,180	6.77	9,230
4	5.34	5,330	5.31	5,250	5.66	6,130	6.16	7,480	6.52	8,500	6.89	9,590
8	5.32	5,280	5.35	5,350	5.75	6,360	6.27	7,790	6.59	8,700	7.00	9,920
12	5.30	5,230	5.37	5,400	5.80	6,490	6.32	7,930	6.62	8,790	7.03	10,000
	May 29		May 30		May 31		June 1		June 2		June 3	
4	7.07	10,100	7.16	10,400	6.87	9,530	6.57	8,640	6.58	8,670	6.81	9,350
8	7.07	10,100	7.12	10,300	6.83	9,410	6.55	8,580	6.59	8,700	6.85	9,470
N	7.08	10,200	7.08	10,200	6.78	9,260	6.56	8,610	6.65	8,880	6.91	9,650
4	7.14	10,400	7.05	10,100	6.73	9,110	6.59	8,700	6.72	9,080	7.00	9,920
8	7.19	10,500	6.98	9,860	6.68	8,960	6.59	8,700	6.77	9,230	7.12	10,300
12	7.20	10,500	6.92	9,680	6.62	8,790	6.58	8,670	6.80	9,320	7.23	10,600
	June 4		June 5		June 6		June 7		June 8		June 9	
4	7.29	10,800	7.17	10,400	6.95	9,770	6.94	9,740	7.00	9,920	7.02	9,980
8	7.31	10,900	7.12	10,300	6.93	9,710	6.94	9,740	6.99	9,890	7.00	9,920
N	7.31	10,900	7.09	10,200	6.92	9,680	6.95	9,770	6.99	9,890	7.01	9,950
4	7.30	10,900	7.06	10,100	6.95	9,770	6.99	9,890	7.02	9,980	7.06	10,100
8	7.28	10,800	7.03	10,000	6.97	9,830	7.03	10,000	7.03	10,000	7.10	10,200
12	7.25	10,700	6.98	9,860	6.95	9,770	7.02	9,980	7.05	10,100	7.12	10,300
	June 10		June 11		June 12		June 13		June 14		June 15	
4	7.09	10,200	6.90	9,620	6.79	9,290	6.63	8,820	6.58	8,670	6.37	8,090
8	7.06	10,100	6.86	9,500	6.75	9,170	6.58	8,670	6.53	8,530	6.32	7,950
N	7.03	10,000	6.85	9,470	6.72	9,080	6.57	8,640	6.51	8,470	6.29	7,870
4	7.02	9,980	6.86	9,500	6.71	9,050	6.56	8,610	6.50	8,440	6.27	7,810
8	7.00	9,920	6.87	9,530	6.71	9,050	6.60	8,730	6.47	8,350	6.22	7,670
12	6.95	9,770	6.84	9,440	6.66	8,900	6.62	8,790	6.42	8,210	6.17	7,530
	June 16		June 17		June 18		June 19		June 20		June 21	
4	6.12	7,390	6.05	7,200	5.86	6,710	5.69	6,260	5.56	5,920	5.57	5,970
8	6.09	7,310	6.01	7,090	5.81	6,570	5.69	6,260	5.61	6,050	5.61	6,070
N	6.08	7,280	5.98	7,000	5.77	6,460	5.69	6,260	5.56	5,920	5.67	6,230
4	6.12	7,390	5.98	7,000	5.76	6,440	5.69	6,260	5.56	5,920	5.74	6,410
8	6.12	7,390	5.94	6,900	5.73	6,360	5.65	6,150	5.56	5,920	5.81	6,600
12	6.08	7,280	5.90	6,790	5.70	6,280	5.61	6,050	5.55	5,900	5.87	6,760

Supplemental record.- June 4, 11 a.m., 7.32 ft., 10,900 sec.-ft.

## Salmon River near Shoup, Idaho

Location.- Lat. 45°19'30", long. 114°25', in sec. 13, T. 23 N., R. 17 E., 200 feet downstream from highway bridge, 1 mile downstream from Panther Creek, and 8 miles southwest of Shoup.

Drainage area.- 6,270 square miles.

Gage-height record.- Staff gage read once daily.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 11,400 second-feet and extended to peak stage.

Maxima.- May-June 1948: Discharge observed, 16,900 second-feet 5 p.m. June 4 (gage height, 7.90 feet).

1944 to April 1948: Discharge observed, 16,600 second-feet May 10, 1947 (gage height, 7.79 feet).

Remarks.- Diversions above station for irrigation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2,840	12,600	8,870	11	3,380	13,700	4,410	21	9,900	8,730	3,010
2	2,680	13,200	7,100	12	3,190	12,500	4,200	22	10,200	9,900	2,680
3	2,520	15,300	7,100	13	3,380	11,800	3,990	23	9,700	8,970	2,680
4	2,370	16,900	6,640	14	3,780	9,800	3,780	24	7,100	8,750	2,680
5	2,370	16,600	6,410	15	3,980	10,200	3,580	25	9,450	8,020	2,520
6	2,460	15,300	5,950	16	4,200	9,800	3,580	26	11,100	8,020	2,370
7	3,010	14,500	5,510	17	4,200	9,700	3,190	27	13,200	7,790	2,370
8	4,410	14,500	5,070	18	7,100	8,750	2,840	28	15,300	7,330	2,370
9	4,200	15,000	5,070	19	8,730	8,490	3,010	29	16,600	7,100	2,370
10	3,580	14,800	4,630	20	10,200	8,250	3,010	30	15,800	6,870	2,370
								31	13,200		2,370
Monthly mean discharge, in second-feet .....									6,908	11,110	3,985
Runoff, in inches .....									1.27	1.98	0.73

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
6	May 17 2.70	4,200	5	May 26 5.70	11,100	5	June 4 7.90	16,900	5	June 13 6.00	11,900
5	May 18 4.00	7,100	5	May 27 6.50	13,200	5	June 5 7.80	16,600	7	June 14 5.20	9,900
5	May 19 4.70	8,730	4	May 28 7.30	15,300	6	June 6 7.30	15,300	6	June 15 5.30	10,200
5	May 20 5.30	10,200	5	May 29 7.80	16,600	5	June 7 7.00	14,500	7	June 16 5.20	9,900
12:40 5:30	May 21 5.25 5.15	10,000 9,800	4	May 30 7.50	15,800	5	June 8 7.00	14,500	6	June 17 5.10	9,700
6	May 22 5.30	10,200	5	May 31 6.50	13,200	4	June 9 7.20	15,000	5:45	June 18 4.70	8,730
2	May 23 5.10	9,700	5	June 1 6.30	12,600	5	June 10 7.10	14,800	5	June 19 4.60	8,490
5	May 24 4.00	7,100	5	June 2 6.50	13,200	4	June 11 6.70	13,700	4	June 20 4.50	8,250
5	May 25 5.00	9,450	5	June 3 7.30	15,300	12:50 5	June 12 6.30 6.20	12,600 12,400	5	June 21 4.70	8,730

Note.- All readings made after noon.

## Salmon River near French Creek, Idaho

Location.- Lat. 45°28', long. 115°59', in sec. 8, T. 24 N., R. 4 E., 100 feet downstream from Fall Creek, 2½ miles northeast of French Creek post office, and 16 miles east of Riggins.

Drainage area.- 12,270 square miles.

Gage-height record.- Staff gage read twice daily.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 65,500 second-feet and extended to peak stage.

Maxima.- May-June 1948: Discharge observed, 75,300 second-feet 7:25 a.m. May 29 (gage height, 33.50 feet).

1944 to April 1948: Discharge observed, 67,300 second-feet May 9, 1947 (gage height, 30.7 feet, from high-water mark).

Remarks.- Diversion above station for irrigation is negligible percentage of total flow.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	11,300	60,700	23,600	11	14,400	59,400	13,500	21	50,100	35,900	9,900
2	10,600	62,300	23,700	12	13,900	54,400	13,300	22	50,200	37,700	9,380
3	9,900	71,700	22,200	13	14,700	51,900	12,700	23	48,200	34,700	9,000
4	9,690	71,000	20,700	14	17,300	48,700	12,000	24	47,000	32,400	8,560
5	9,520	66,800	19,400	15	18,600	45,300	11,500	25	50,400	30,800	8,200
6	9,960	64,500	18,100	16	20,900	43,200	11,000	26	57,400	29,300	7,860
7	13,600	66,500	16,600	17	25,700	40,100	10,500	27	63,700	27,500	7,670
8	17,400	67,300	15,700	18	37,300	37,500	10,300	28	69,800	26,200	7,980
9	17,400	65,700	14,800	19	42,900	35,300	10,400	29	74,800	24,900	8,660
10	15,600	63,100	14,100	20	49,100	33,900	10,500	30	68,500	23,900	8,260
								31	62,600		7,600
Monthly mean discharge, in second-feet .....									32,980	47,090	12,830
Runoff, in inches .....									3.10	4.28	1.21

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
May 17			May 26			June 4			June 13		
7:30	12.66	21,900	7:35	26.42	55,600	7:30	32.50	72,400	7	25.08	52,100
6:30	15.96	29,600	6:30	27.68	59,000	6:40	31.50	69,600	6:20	24.94	51,700
May 18			May 27			June 5			June 14		
7:30	18.52	35,700	7:50	29.00	62,600	7:30	30.90	67,900	7	24.08	49,500
6:30	19.82	38,900	6:25	29.80	64,800	6:30	30.10	65,700	6:35	23.48	48,000
May 19			May 28			June 6			June 15		
7:45	20.72	41,100	7:30	31.40	69,300	7:20	30.28	66,100	7:30	22.64	45,900
6:30	22.14	44,600	6:30	31.76	70,300	6:30	29.04	62,700	6:30	22.18	44,700
May 20			May 29			June 7			June 16		
7:15	23.66	48,400	7:25	33.50	75,300	7:15	30.30	66,200	7:30	21.82	43,800
6:25	24.20	49,800	6:30	33.10	74,200	7	30.50	66,800	6:30	21.34	42,600
May 21			May 30			June 8			June 17		
7:45	24.42	50,400	7:20	31.70	70,200	7	30.80	67,600	8:45	20.38	40,200
6:20	24.22	49,800	6:35	30.48	66,700	6	30.58	67,000	6:45	20.26	39,900
May 22			May 31			June 9			June 18		
8	24.26	49,900	7:45	29.54	64,100	6:15a	30.34	66,300	7:30	19.52	38,100
6:20	24.46	50,500	6:25	28.48	61,200	6:30p	29.84	64,900	6:35	18.94	36,700
May 23			June 1			June 10			June 19		
7:45	23.78	48,700	7:10	28.48	61,200	6a	29.56	64,200	7:15	18.42	35,500
6:20	23.36	47,700	6:20	28.14	60,300	6:30p	28.76	62,000	6:35	18.28	35,200
May 24			June 2			June 11			June 20		
7:45	23.30	47,500	7:15	28.26	60,600	7:20	28.02	60,000	7:20	17.94	34,400
6:25	22.88	46,500	6:15	29.48	63,900	6:30	27.56	58,700	6:30	17.56	33,400
May 25			June 3			June 12			June 21		
7:30	24.12	49,600	7:30	31.40	69,300	7	26.44	55,600	7:30	18.12	34,800
6:30	24.76	51,200	6:35	33.04	74,000	6:15	25.48	53,100	6:40	19.04	37,000



## Salmon River at Whitebird, Idaho

Location.- Lat. 45°45', long. 116°20', in sec. 22, T. 28 N., R. 1 E., just upstream from Whitebird Creek, half a mile downstream from Canfield-Joseph highway bridge, and 1 mile southwest of Whitebird.

Drainage area.- 13,550 square miles, including that of Whitebird Creek.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge, 103,000 second-feet 9 to 12 p.m. June 3 (gage height, 32.95 feet).

1910-17, 1919 to April 1948: Discharge observed, 88,800 second-feet June 9,

1921 (gage height, 31.2 feet).

Stage known, about 37.5 feet, present datum, June 1894 (discharge, 120,000

second-feet).

Remarks.- Negligible amount of diversion above station.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	14,600	80,800	26,000	11	18,000	78,900	14,900	21	62,100	40,900	11,000
2	14,000	84,300	25,800	12	17,200	71,400	14,600	22	67,500	43,800	10,400
3	13,000	96,400	24,000	13	17,900	66,600	13,900	23	66,400	40,700	9,860
4	12,800	98,203	22,500	14	20,500	62,000	13,100	24	62,600	37,200	9,430
5	12,700	91,000	21,100	15	22,300	56,500	12,500	25	66,200	35,000	9,180
6	12,800	88,900	19,500	16	24,200	53,200	12,000	26	75,900	33,000	8,810
7	16,000	90,000	18,100	17	31,000	48,500	11,500	27	85,500	30,900	8,580
8	20,000	90,900	17,000	18	41,800	44,300	11,200	28	92,600	29,200	8,990
9	21,500	88,400	16,200	19	50,400	41,100	11,200	29	99,200	27,700	9,980
10	19,400	85,100	15,400	20	59,100	39,400	11,500	30	92,900	26,400	9,790
								31	84,500		9,110
Monthly mean discharge, in second-feet.....									42,410	60,020	14,100
Runoff, in inches.....									3.61	4.94	1.20

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	20.95	28,300	23.08	38,400	24.81	48,200	26.30	57,500	27.03	62,400	27.21	63,600
8	21.30	29,800	23.45	40,400	24.97	49,100	26.54	59,100	27.07	62,700	27.55	65,800
N	21.65	31,400	23.80	42,400	25.09	49,800	26.64	59,800	26.92	61,600	28.03	69,100
8	21.85	32,300	23.95	43,200	25.26	50,900	26.70	60,200	26.86	61,500	28.16	70,000
12	22.10	35,500	24.26	45,000	25.55	52,800	26.87	61,300	27.00	62,200	28.24	70,500
12	22.57	35,800	24.64	47,200	26.00	55,600	26.99	62,100	27.06	62,600	28.17	70,000
	May 23		May 24		May 25		May 26		May 27		May 28	
4	28.00	68,900	27.21	63,600	27.29	64,100	28.61	73,000	30.10	83,200	31.21	91,100
8	27.80	67,500	27.13	63,100	27.49	65,400	28.90	74,900	30.29	84,500	31.43	92,600
N	27.56	65,900	27.00	62,200	27.56	65,900	29.03	75,800	30.38	85,200	31.49	93,000
4	27.37	64,700	26.85	61,200	27.61	66,300	29.17	76,700	30.43	85,500	31.51	93,200
8	27.32	64,300	26.96	61,900	27.89	68,100	29.45	78,600	30.66	87,100	31.58	93,700
12	27.27	64,000	27.15	63,200	28.32	71,000	29.84	81,400	30.96	89,200	31.77	90,000
	May 29		May 30		May 31		June 1		June 2		June 3	
4	32.12	97,400	32.03	96,800	30.64	87,000	29.85	81,400	30.05	82,800	30.92	88,900
8	32.53	100,400	31.79	95,100	30.49	85,900	29.82	81,200	30.24	84,200	31.28	91,600
N	32.59	100,800	31.45	92,800	30.27	84,400	29.73	80,600	30.26	84,500	32.15	97,600
4	32.53	100,400	31.14	90,600	30.07	83,000	29.64	80,000	30.26	84,300	32.65	101,200
8	32.42	99,600	30.93	89,000	29.90	81,800	29.63	79,900	30.42	85,400	32.94	103,300
12	32.24	98,300	30.78	88,000	29.88	81,700	29.88	81,700	30.74	87,700	32.95	103,400
	June 4		June 5		June 6		June 7		June 8		June 9	
4	32.75	102,000	31.50	93,100	31.07	90,100	31.10	90,300	31.36	92,100	31.09	90,200
8	32.50	100,200	31.36	92,100	30.98	89,400	31.10	90,300	31.30	91,700	30.96	89,200
N	32.19	97,900	31.16	90,700	30.82	88,200	30.98	89,400	31.16	90,700	30.79	88,000
4	31.90	95,900	30.95	89,200	30.71	87,500	30.90	88,800	31.04	89,800	30.58	86,600
8	31.73	94,700	30.92	88,900	30.83	88,300	31.09	90,200	31.04	89,800	30.66	87,100
12	31.65	94,200	31.05	89,900	31.05	89,900	31.30	91,700	31.11	90,400	30.82	88,200
	June 10		June 11		June 12		June 13		June 14		June 15	
4	30.75	87,800	29.88	81,700	28.89	74,800	27.77	67,300	27.40	64,900	26.48	58,800
8	30.60	86,700	29.67	80,200	28.64	73,200	27.73	67,100	27.17	63,500	26.21	57,000
N	30.36	85,000	29.45	78,600	28.31	71,000	27.66	66,600	26.92	61,600	26.00	55,600
4	30.12	83,500	29.26	77,300	28.02	69,000	27.51	65,600	26.67	60,000	25.85	54,600
8	29.98	82,400	29.11	76,300	27.89	68,100	27.55	65,800	26.55	59,200	26.04	55,800
12	30.01	82,600	29.10	76,200	27.87	68,000	27.59	66,100	26.60	59,500	25.95	55,300
	June 16		June 17		June 18		June 19		June 20		June 21	
4	25.84	54,600	25.21	50,600	24.44	46,000	23.70	41,800	23.45	40,400	23.28	39,500
8	25.71	53,800	24.98	49,200	24.27	45,000	23.60	41,300	23.31	39,700	23.36	40,000
N	25.60	53,100	24.80	48,100	24.11	44,200	23.53	40,900	23.21	39,200	23.54	40,900
4	25.48	52,500	24.62	47,100	23.98	43,400	23.43	40,400	23.11	38,600	23.70	41,800
8	25.41	51,900	24.55	46,700	23.85	42,600	23.44	40,400	23.12	38,600	23.79	42,300
12	25.40	51,800	24.53	46,600	23.80	42,400	23.50	40,700	23.24	39,300	23.90	42,900

Supplemental record.- June 3, 9 p.m., 32.95 ft., 103,400 sec.-ft.

## Alturas Lake Creek near Obsidian, Idaho

Location.- Lat. 43°56', long. 114°50', in SW $\frac{1}{4}$  sec. 9, T. 7 N., R. 14 E., 1 mile downstream from outlet of Perkins Lake, 1 $\frac{1}{2}$  miles downstream from outlet of Alturas Lake, and 4 miles south of Obsidian.

Drainage area.- 35.7 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 570 second-feet and extended to peak stage. Shifting-control method used May 1 to July 31.

Maxima.- May-June 1948: Discharge, 609 second-feet noon to 4 p.m. June 9 (gage height, 5.41 feet).

1940 to April 1948: Discharge, 612 second-feet May 31, 1943 (gage height, 5.30 feet).

Remarks.- No diversion or regulation above station.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	43	452	201	11	62	568	95	21	268	310	58
2	42	488	189	12	65	535	90	22	264	282	56
3	42	568	176	13	74	538	86	23	247	260	53
4	44	594	162	14	80	532	83	24	244	242	54
5	43	564	148	15	90	494	78	25	279	232	49
6	46	548	133	16	102	460	74	26	358	220	47
7	50	557	123	17	125	414	70	27	427	209	45
8	57	568	115	18	166	373	65	28	509	199	42
9	59	601	107	19	234	338	63	29	586	194	40
10	60	592	101	20	255	308	60	30	553	197	39
								31	473		39
Monthly mean discharge, in second-feet									192	415	88.4
Runoff, in inches									6.20	12.98	2.86

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	3.08	110	3.39	148	3.81	215						
8	3.11	113	3.43	153	3.88	228	4.01	253			4.08	266
N	3.17	121	3.49	162	3.89	230			4.08	269		
4	3.27	133	3.55	171	4.00	253					4.06	262
8	3.35	143	3.68	192	3.99	251	4.03	257				
12	3.37	146	3.71	197	4.00	253	4.07	266	4.08	269	4.04	257
	May 23		May 24		May 25		May 26		May 27		May 28	
4									4.68	413	4.91	473
8	4.01	251							4.73	426	4.99	495
N			3.98	244	4.14	278	4.49	364	4.74	429	5.04	509
4	3.97	242			4.17	285	4.51	369	4.75	432	5.12	532
8			3.98	244	4.22	297			4.77	437	5.15	540
12	3.96	240	4.02	253	4.28	311	4.62	397	4.82	451	5.21	558
	May 29		May 30		May 31		June 1		June 2		June 3	
4	5.27	576	5.28	579								
8	5.31	588			4.96	484			4.95	481	5.16	538
N	5.34	597	5.20	555			4.85	454			5.28	573
4	5.33	594			4.86	456			4.99	492	5.32	585
8					4.83	448	4.85	454	5.03	503		
12	5.29	582	5.06	515	4.82	445	4.87	459	5.12	529	5.37	600
	June 4		June 5		June 6		June 7		June 8		June 9	
4											5.35	591
8	5.38	603					5.24	558	5.28	570	5.39	603
N			5.26	567	5.22	552					5.41	609
4	5.34	591	5.23	558			5.25	561	5.27	567	5.41	609
8					5.18	540			5.28	570		
12	5.29	576	5.21	552	5.19	543	5.25	561	5.30	576	5.39	603
	June 10		June 11		June 12		June 13		June 14		June 15	
4							5.17	540				
8	5.38	600	5.30	579	5.18	543			5.17	540	5.04	503
N												
4	5.34	588	5.25	564	5.13	529	5.17	540	5.13	529	4.97	484
8					5.09	517			5.10	520		
12	5.30	576	5.20	549	5.12	526	5.16	538	5.08	515	4.94	475
	June 16		June 17		June 18		June 19		June 20		June 21	
4											4.34	324
8	4.90	467	4.74	424	4.55	374	4.44	346	4.30	311	4.27	306
N											4.29	311
4	4.85	454	4.67	405	4.53	369	4.37	328	4.28	306	4.30	314
8												
12	4.80	440	4.60	387	4.51	364	4.32	316	4.25	299	4.25	301



## Yankee Fork Salmon River near Clayton, Idaho

Location.- Lat. 44°17', long. 114°44', in sec. 17, T. 11 N., R. 15 E., half a mile upstream from mouth and 17 miles west of Clayton.

Drainage area.- 195 square miles.

Gage-height record.- Water-stage recorder graph except period May 1-8 when there was no gage-height record except staff-gage reading on May 4.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 1,710 second-feet and extended to peak stage. Discharge for periods of no gage-height record computed on basis of records for Salmon River below Valley Creek, at Stanley, and below Yankee Fork, near Clayton.

Maxima.- May-June 1948: Discharge, 2,260 second-feet 2 a.m. to 3 a.m. May 29 (gage height, 5.97 feet).

1921 to April 1948: Discharge, 3,360 second-feet June 12, 1921 (gage height, 6.79 feet, site and datum then in use), from rating curve extended above 2,300 second-feet.

Remarks.- No diversion or regulation above station.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	175	1,700	487	11	232	1,600	281	21	1,160	743	194
2	165	1,920	466	12	225	1,380	271	22	996	690	188
3	165	2,180	434	13	284	1,330	258	23	869	636	182
4	174	2,040	408	14	361	1,200	246	24	1,020	628	178
5	165	1,890	378	15	424	1,030	236	25	1,510	603	170
6	220	1,950	361	16	595	952	227	26	1,890	572	165
7	480	2,030	341	17	856	825	220	27	2,070	535	161
8	400	2,000	321	18	1,100	751	215	28	2,140	521	159
9	299	1,950	305	19	1,320	689	209	29	2,080	504	159
10	258	1,740	294	20	1,310	685	200	30	1,780	493	150
								31	1,540		145
Monthly mean discharge, in second-feet .....									847	1,192	258
Runoff, in inches .....									5.01	6.82	1.53

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	3.98	782	4.67	1,220	4.66	1,210	4.95	1,420	4.72	1,260	4.43	1,050
8	3.93	755	4.52	1,120	4.75	1,280	4.85	1,350	4.63	1,190	4.37	1,010
N	3.87	724	4.40	1,030	4.72	1,280	4.70	1,240	4.52	1,120	4.34	990
4	3.89	734	4.32	978	4.85	1,350	4.61	1,180	4.47	1,080	4.29	960
8	4.49	1,100	4.32	978	5.00	1,460	4.74	1,270	4.49	1,100	4.27	948
12	4.78	1,300	4.62	1,190	5.01	1,470	4.79	1,300	4.50	1,100	4.25	936
	May 23		May 24		May 25		May 26		May 27		May 28	
4	4.17	888	4.28	960	4.98	1,460	5.61	1,960	5.80	2,120	5.87	2,180
8	4.11	854			4.96	1,440	5.47	1,850	5.72	2,060	5.82	2,100
N	4.06	828	4.19	906	4.90	1,400	5.35	1,750	5.59	1,950	5.78	2,040
4	4.04	815	4.23	930	4.93	1,420	5.40	1,790	5.61	1,970	5.70	2,040
8	4.16	882	4.63	1,200	5.28	1,690	5.68	2,000	5.83	2,140	5.90	2,120
12	4.29	960	4.93	1,410	5.58	1,930	5.78	2,100	5.92	2,220	5.95	2,240
	May 29		May 30		May 31		June 1		June 2		June 3	
4	5.88	2,180	5.56	1,930	5.12	1,580	5.28	1,700	5.57	1,940	5.89	2,190
8	5.83	2,140	5.42	1,820	5.02	1,500	5.23	1,660	5.54	1,910	5.92	2,220
N	5.70	2,040	5.36	1,770	4.96	1,460	5.17	1,620	5.50	1,880	5.88	2,180
4	5.68	2,020	5.28	1,700	4.97	1,470	5.16	1,610	5.45	1,840	5.88	2,180
8	5.60	1,960	5.25	1,680	5.07	1,540	5.39	1,790	5.60	1,960	5.91	2,210
12	5.62	1,980	5.20	1,640	5.26	1,690	5.55	1,920	5.74	2,070	5.88	2,180
	June 4		June 5		June 6		June 7		June 8		June 9	
4	5.79	2,110	5.60	1,960	5.65	2,000	5.71	2,050	5.73	2,060	5.70	2,040
8	5.72	2,060	5.51	1,890	5.60	1,960	5.71	2,050	5.70	2,040	5.63	1,980
N	5.65	2,000	5.43	1,820	5.50	1,880	5.67	2,020	5.60	1,960	5.57	1,940
4	5.64	1,990	5.41	1,810	5.47	1,860	5.60	1,960	5.63	1,900	5.47	1,860
8	5.61	1,970	5.51	1,890	5.60	1,960	5.67	2,020	5.65	2,000	5.53	1,900
12	5.63	1,980	5.61	1,970	5.73	2,060	5.74	2,070	5.70	2,040	5.53	1,900
	June 10		June 11		June 12		June 13		June 14		June 15	
4	5.43	1,820			4.98	1,470	4.83	1,360				
8	5.35	1,760	5.23	1,660			4.85	1,380	4.70	1,270	4.37	1,040
N	5.30	1,720			4.83	1,360						
4	5.22	1,660	5.05	1,520	4.77	1,320	4.75	1,300	4.50	1,130	4.27	972
8	5.27	1,700									4.30	990
12	5.30	1,720	5.02	1,500	4.77	1,320	4.75	1,300	4.50	1,130	4.36	1,030
	June 16		June 17		June 18		June 19		June 20		June 21	
4									3.80	709		
8	4.29	984	4.05	842	3.89	755	3.77	695			3.87	745
N											3.90	760
4	4.17	912	3.96	793	3.85	734	3.70	662	3.70	662	3.89	755
8					3.87	745	3.69	658	3.71	667		
12	4.13	888	3.94	782	3.86	740	3.79	704	3.77	695	3.89	755

Supplemental record.- May 29, 2 to 3 a.m., 5.97 ft., 2,260 sec.-ft.; June 3, 6 a.m., 5.96 ft., 2,250 sec.-ft.

## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

## Challis Creek near Challis, Idaho

Location.- Lat.  $44^{\circ}34'$ , long.  $114^{\circ}19'$ , in sec. 2, T. 14 N., R. 18 E., an eighth of a mile downstream from Eddy Creek, 6 miles northwest of Challis, and  $6\frac{1}{4}$  miles upstream from mouth.

Drainage area.- 85 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 300 second-feet and extended to peak stage.

Maxima.- May-June 1948: Discharge, 418 second-feet 2 a.m. and 6 a.m. June 4 (gage height, 2.30 feet).

1943 to April 1948: Discharge, 388 second-feet May 9, 1947 (gage height, 2.07 feet).

Remarks.- Diversions above station for irrigation.

Mean discharge, in second-feet, 1948

Mean discharge, in second-feet, 1960							
Day	May	June	July	Day	May	June	July
1	27	284	127	11	35	313	82
2	25	317	126	12	54	297	81
3	25	373	118	13	37	272	79
4	25	403	113	14	41	245	75
5	24	380	103	15	45	215	72
6	28	380	100	16	56	204	71
7	42	380	96	17	78	189	68
8	43	384	91	18	110	180	67
9	39	373	86	19	137	171	63
10	38	330	85	20	146	163	62
							31
Monthly mean discharge, in second-feet .....							111
Runoff, in inches .....							-
							245
							75.9
							-



## Middle Fork Salmon River near Cape Horn, Idaho

Location.- Lat. 44°25', long. 115°11', in sec. 34, T. 13 N., R. 11 E., 1,100 feet downstream from Little Beaver Creek, half a mile downstream from confluence of Marsh and Beaver Creeks, and 2 miles northwest of Cape Horn.

Drainage area.- 138 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 1,750 second-feet and extended to peak stage.

Maxima.- May-June 1948: Discharge, 2,340 second-feet 3 to 4 a.m. June 3 (gage height, 6.28 feet).

1928 to April 1948: Discharge, 2,340 second-feet June 9, 1933, and about May 31, 1943; gage height, 6.26 feet June 9, 1933.

Remarks.- No diversion above station.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	147	1,730	514	11	215	1,690	301	21	1,230	964	215
2	141	1,920	496	12	229	1,520	287	22	1,120	856	206
3	145	2,220	465	13	312	1,570	277	23	1,110	757	201
4	143	2,020	443	14	348	1,350	267	24	1,230	713	195
5	141	1,920	398	15	402	1,210	254	25	1,400	674	192
6	174	1,950	371	16	518	1,130	245	26	1,600	630	187
7	261	2,010	352	17	732	1,030	238	27	1,820	580	187
8	248	2,030	337	18	974	965	232	28	2,010	551	190
9	225	2,010	318	19	1,250	889	223	29	2,020	527	190
10	212	1,830	308	20	1,300	858	220	30	1,770	509	179
								31	1,620		172
Monthly mean discharge, in second-feet									808	1,287	279
Runoff, in inches									6.75	10.41	2.33

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	4.09	620	4.58	898	4.94	1,140	5.00	1,180	5.08	1,240	4.96	1,150
8	4.01	580	4.48	838	4.49	1,170	4.91	1,120	4.94	1,140	4.86	1,080
N	4.02	585	4.51	856	5.03	1,200	4.96	1,150	4.96	1,150	4.82	1,050
4	4.39	784	4.76	1,010	5.23	1,350	5.24	1,360	5.07	1,230	4.89	1,100
8	4.76	1,010	5.00	1,180	5.33	1,430	5.52	1,600	5.16	1,300	4.94	1,140
12	4.69	968	4.96	1,150	5.19	1,320	5.31	1,420	5.11	1,260	4.85	1,080
	May 23		May 24		May 25		May 26		May 27		May 28	
4	4.74	1,000	4.85	1,080	5.10	1,250	5.42	1,510	5.64	1,710	5.99	2,050
8	4.64	956	4.72	988	5.00	1,180	5.34	1,440	5.56	1,630	5.87	1,930
N	4.66	949	4.77	1,020	5.04	1,210	5.35	1,450	5.57	1,640	5.83	1,890
4	5.01	1,190	5.28	1,390	5.44	1,530	5.60	1,670	5.79	1,850	5.87	1,930
8	5.32	1,430	5.47	1,550	5.62	1,690	5.77	1,830	6.05	2,110	6.05	2,110
12	5.08	1,240	5.30	1,410	5.55	1,620	5.73	1,790	6.07	2,130	6.13	2,190
	May 29		May 30		May 31		June 1		June 2		June 3	
4	6.10	2,160	5.81	1,870	5.57	1,640	5.66	1,720	5.85	1,910	6.26	2,340
8	5.97	2,030	5.72	1,780	5.49	1,570	5.58	1,650	5.78	1,840	6.21	2,280
N	5.87	1,930	5.64	1,710	5.42	1,510	5.53	1,610	5.73	1,790	6.14	2,200
4	5.88	1,940	5.62	1,690	5.48	1,560	5.61	1,680	5.80	1,860	6.11	2,170
8	5.94	2,000	5.68	1,740	5.66	1,720	5.83	1,890	6.04	2,100	6.13	2,190
12	5.92	1,980	5.65	1,720	5.69	1,750	5.89	1,950	6.08	2,140	6.13	2,190
	June 4		June 5		June 6		June 7		June 8		June 9	
4	6.05	2,110	5.90	1,960	5.92	1,980	6.00	2,060	5.99	2,050	6.03	2,090
8	5.95	2,010	5.83	1,890	5.85	1,910	5.95	2,010	5.95	2,010	5.95	2,010
N	5.89	1,950	5.77	1,830	5.80	1,860	5.88	1,940	5.90	1,960	5.90	1,960
4	5.87	1,930	5.80	1,860	5.81	1,870	5.88	1,940	5.91	1,970	5.86	1,920
8	5.95	2,010	5.93	1,990	5.96	2,020	5.98	2,040	6.02	2,080	5.95	2,010
12	5.95	2,010	5.95	2,010	6.02	2,080	6.01	2,070	6.06	2,120	5.92	1,980
	June 10		June 11		June 12		June 13		June 14		June 15	
4	5.85	1,910					5.60	1,670				
8	5.78	1,840	5.65	1,720	5.45	1,540	5.56	1,630	5.26	1,380	5.05	1,220
N	5.75	1,790										
4	5.68	1,740	5.55	1,620	5.34	1,440	5.43	1,520	5.15	1,290	4.97	1,160
8	5.76	1,820									5.04	1,210
12	5.76	1,820	5.56	1,630	5.43	1,520	5.39	1,480	5.13	1,270	5.05	1,220
	June 16		June 17		June 18		June 19		June 20		June 21	
4					4.62	923	4.58	898			4.59	904
8	4.94	1,140			4.61	916					4.65	942
N	4.90	1,113	4.75	1,010	4.75	1,010	4.50	850	4.47	832	4.71	982
4	4.89	1,100	4.77	1,020	4.75	1,010			4.50	850	4.76	1,010
8			4.76	1,010	4.75	1,010			4.56	886	4.75	1,010
12	4.88	1,100	4.71	982	4.70	975	4.52	862	4.59	904	4.69	968

Supplemental record.- 6.26 ft., 3 a.m., June 3, 2,340 sec.-ft.

## Bear Valley Creek near Cape Horn, Idaho

Location.- Lat. 44°26', long. 115°17', in sec. 29, T. 13 N., R. 10 E., 250 feet downstream from Fir Creek, 3 miles upstream from mouth, and 7 miles northwest of Cape Horn.

Drainage area.- 180 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 2,250 second-feet and extended to peak stage. Shifting-control method used May 1 to July 31.

Maxima.- May-June 1948: Discharge, 2,960 second-feet 7 a.m. May 29 (gage height, 5.15 feet).

1921 to April 1948: Discharge, 3,450 second-feet June 9, 1933 (gage height, 5.49 feet), from rating curve extended above 2,000 second-feet.

Remarks.- No diversion or regulation above station.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	222	1,960	467	11	296	1,750	292	21	1,750	1,050	215
2	201	2,080	484	12	322	1,600	292	22	1,680	958	205
3	208	2,460	440	13	440	1,510	275	23	1,500	786	198
4	205	2,270	420	14	544	1,390	259	24	1,670	701	191
5	194	2,100	386	15	645	1,300	248	25	1,950	651	188
6	229	2,100	362	16	626	1,250	240	26	2,160	609	185
7	376	2,150	348	17	1,100	1,180	233	27	2,190	561	182
8	367	2,140	330	18	1,360	1,040	225	28	2,610	522	185
9	330	2,120	308	19	1,680	1,020	222	29	2,620	469	191
10	304	1,930	296	20	1,750	906	218	30	2,230	462	182
								31	1,930		175
Monthly mean discharge, in second-feet.....									1,093	1,368	272
Runoff, in inches.....									7.00	8.48	1.74

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	3.16	975	3.56	1,280	3.87	1,540	3.99	1,650	4.14	1,800	4.09	1,750
8					3.91	1,580	3.96	1,620				
N	3.16	975	3.57	1,290	4.00	1,660	4.05	1,690	4.05	1,720	4.03	1,700
4	3.42	1,170	3.72	1,410	4.16	1,810	4.19	1,840	4.08	1,740	3.99	1,660
8	3.63	1,340	3.86	1,530	4.19	1,840	4.25	1,900	4.04	1,710		
12	3.58	1,300	3.82	1,490	4.13	1,780	4.21	1,860	4.07	1,730	3.89	1,570
	May 23		May 24		May 25		May 26		May 27		May 28	
4			3.99	1,670	4.30	1,980	4.55	2,260	4.53	2,250	4.88	2,630
8			4.00	1,680	4.37	2,050	4.64	2,360	4.61	2,340	5.15	2,960
N	3.74	1,440	3.95	1,650	4.25	1,950	4.52	2,220	4.52	2,240	5.01	2,790
4	3.71	1,420	3.92	1,610	4.19	1,870	4.35	2,040	4.38	2,080	4.80	2,540
8	3.85	1,540			4.24	1,920	4.34	2,030	4.34	2,040	4.66	2,380
12	3.93	1,610	4.17	1,840	4.35	2,050	4.42	2,120	4.51	2,220	4.72	2,460
	May 29		May 30		May 31		June 1		June 2		June 3	
4	5.01	2,790	4.66	2,390	4.28	1,480	4.17	1,870	4.22	1,920	4.45	2,160
8	5.14	2,950	4.70	2,450	4.31	2,010	4.34	2,040	4.40	2,100	4.68	2,410
N	4.99	2,770	4.60	2,320	4.30	2,000	4.42	2,180	4.57	2,290	4.89	2,650
4	4.76	2,500	4.45	2,140			4.30	2,000	4.49	2,200	4.92	2,680
8	4.61	2,340	4.30	2,000	4.12	1,820	4.17	1,870	4.37	2,070	4.85	2,600
12	4.57	2,290	4.26	1,960	4.10	1,800	4.14	1,840	4.32	2,020	4.74	2,460
	June 4		June 5		June 6		June 7		June 8		June 9	
4	4.63	2,360	4.34	2,040	4.28	1,980	4.30	2,000	4.31	2,010	4.35	2,050
8	4.59	2,310	4.39	2,090	4.39	2,090	4.44	2,150	4.42	2,130	4.42	2,130
N	4.58	2,300	4.48	2,190	4.54	2,260	4.60	2,320	4.55	2,270	4.53	2,250
4	4.52	2,240	4.45	2,160	4.48	2,190	4.54	2,260	4.52	2,240	4.47	2,180
8			4.38	2,080	4.42	2,130	4.44	2,150	4.44	2,150		
12	4.36	2,060	4.29	1,990	4.31	2,010	4.34	2,040	4.38	2,080	4.26	1,960
	June 10		June 11		June 12		June 13		June 14		June 15	
4	4.22	1,920	4.03	1,730	3.90	1,620	3.76	1,490	3.69	1,430	3.49	1,270
8	4.24	1,940	4.03	1,750	3.88	1,600	3.75	1,480	3.65	1,400	3.49	1,270
N	4.33	2,030	4.10	1,800	3.91	1,620	3.80	1,530			3.51	1,290
4	4.26	1,960	4.11	1,810	3.91	1,620	3.82	1,540	3.62	1,380	3.56	1,330
8							3.80	1,530	3.58	1,350	3.59	1,350
12	4.08	1,780	3.94	1,650	3.80	1,530	3.75	1,480	3.52	1,300	3.53	1,310
	June 16		June 17		June 18		June 19		June 20		June 21	
4	3.47	1,260	3.44	1,230	3.19	1,040			3.00	896		
8	3.44	1,230	3.42	1,220	3.17	1,030	3.23	1,060	2.99	889	3.20	1,040
N	3.44	1,230			3.16	1,020	3.22	1,060	2.99	889	3.26	1,090
4	3.47	1,260	3.34	1,160	3.17	1,030	3.16	1,010	3.00	896	3.27	1,100
8	3.47	1,260							3.04	924		
12	3.46	1,250	3.23	1,070	3.21	1,060	3.04	924	3.09	960	3.20	1,040



## Big Creek near Big Creek, Idaho

Location.- Lat. 45°07', long. 114°55', in sec. 31, T. 21 N., R. 13 E., 1½ miles downstream from Cabin Creek, 2 miles southeast of Wallace Ranch, and 9½ miles east of Big Creek post office.

Drainage area.- 470 square miles.

Gage-height record.- Staff gage read once daily.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 2,840 second-feet and extended to peak stage by logarithmic plotting.

Maxima.- May-June 1948: Discharge, 5,800 second-feet June 3 (gage height, 7.12 feet, from floodmark).

1944 to April 1948: Discharge observed, 4,010 second-feet May 9, 1947 (gage height, 5.8 feet).

Remarks.- Small diversions above station for irrigation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	525	4,230	1,390	11	687	3,110	676	21	2,680	2,110	460
2	497	4,920	1,380	12	665	2,880	676	22	2,310	1,950	460
3	506	5,480	1,290	13	891	2,880	644	23	2,400	1,890	425
4	478	4,360	1,140	14	926	2,850	613	24	2,380	1,740	434
5	534	3,960	1,120	15	998	2,540	613	25	3,130	1,680	421
6	575	4,260	1,140	16	1,210	2,380	613	26	3,650	1,650	404
7	950	4,110	1,010	17	1,620	2,160	573	27	4,130	1,440	404
8	1,010	4,520	856	18	2,400	2,020	597	28	4,680	1,380	400
9	798	4,160	764	19	2,780	2,060	487	29	4,920	1,360	391
10	719	3,600	697	20	2,980	2,110	469	30	4,030	1,440	400
								31	3,420		412
Monthly mean discharge, in second-feet									1,919	2,839	689
Runoff, in inches									4.71	6.74	1.69

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
3:15p	May 17 3.42	1,620	11:30a	May 26 5.50	3,650	4:10p	June 4 6.08	4,360	10:40a	June 13 4.80	2,880
N	May 18 4.32	2,400	10:30a	May 27 5.90	4,130	3p	June 5 5.76	3,960	8:30a	June 14 4.80	2,880
2p	May 19 4.70	2,780	11a	May 28 6.32	4,680	10:45a	June 6 6.00	4,260	10:05a	June 15 4.70	2,780
11:20a	May 20 4.90	2,980	12:30p	May 29 6.50	4,920	9:15a	June 7 5.88	4,110	2:45p	June 16 4.46	2,540
4:15p	May 21 4.60	2,680	5p	May 30 5.82	4,030	N	June 8 6.20	4,520	6:30p	June 17 4.30	2,380
9:20a	May 22 4.22	2,310	10:20a	May 31 5.30	3,420	1:15p	June 9 5.92	4,160	5:40p	June 18 4.06	2,160
9:45a	May 23 4.32	2,400	2:10p	June 1 5.98	4,230	2:10p	June 10 5.46	3,600	6p	June 19 3.90	2,020
3:10p	May 24 4.30	2,380	10a	June 2 6.50	4,920	3:15p	June 11 5.02	3,110	3:10p	June 20 4.00	2,110
11a	May 25 5.04	3,130	5:15p	June 3 6.90	5,480	6:30p	June 12 4.80	2,880	3:20p	June 21 4.00	2,110
									1:10p	June 21 4.00	2,110

## South Fork Salmon River near Knox, Idaho

Location.- Lat. 44°39', long. 115°42', in NW $\frac{1}{4}$  sec. 11, T. 15 N., R. 6 E., 800 feet downstream from Curtis Creek, 1 mile upstream from Warm Lake Creek,  $\frac{1}{2}$  miles south-west of Knox, and 21 miles northeast of Cascade.

Drainage area.- 92 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 1,150 second-feet and extended to peak stage.

Maxima.- May-June 1948: Discharge, 1,330 second-feet 10:40 p.m. May 27 (gage height, 5.95 feet).

1928 to April 1948: Discharge observed, 1,560 second-feet June 9, 1933 (gage height, 4.69 feet, site and datum then in use), from rating curve extended above 1,000 second-feet.

Remarks.- No diversion above station.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	186	998	254	11	260	913	140	21	863	508	103
2	172	1,100	224	12	271	807	132	22	974	424	97
3	184	1,260	202	13	391	763	126	23	861	377	93
4	202	1,160	186	14	406	681	122	24	871	342	90
5	195	1,140	172	15	428	630	116	25	985	312	86
6	271	1,150	164	16	522	569	114	26	1,090	286	83
7	398	1,150	157	17	674	517	110	27	1,210	266	84
8	342	1,150	149	18	769	489	108	28	1,230	249	93
9	280	1,100	142	19	974	463	110	29	1,180	236	90
10	263	1,010	138	20	911	457	106	30	1,020	222	85
								31	952		79
Monthly mean discharge, in second-feet .....									624	691	128
Runoff, in inches .....									7.82	8.38	1.60

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	4.65	647	4.89	762	5.21	922	5.25	942	5.17	902	5.37	1,000
8	4.58	615	4.82	728	5.39	1,010	5.15	892	5.09	862	5.34	988
N	4.53	593	4.78	708	5.35	994	5.08	857	5.00	817	5.30	967
4	4.69	665	4.84	738	5.32	978	5.10	867	5.00	817	5.36	999
8	4.94	787	5.04	837	5.39	1,010	5.24	937	5.07	852	5.32	978
12	4.99	812	6.11	872	5.35	994	5.27	952	5.17	902	5.22	927
	May 23		May 24		May 25		May 26		May 27		May 28	
4	5.13	882	5.09	862	5.30	967	5.62	1,130	5.77	1,210	5.88	1,270
8	5.05	842	5.00	817	5.20	917	5.44	1,040	5.72	1,180	5.80	1,220
N	4.99	812	4.94	787	5.13	882	5.36	999	5.64	1,140	5.74	1,190
4	5.02	827	5.04	837	5.27	952	5.44	1,040	5.72	1,180	5.74	1,190
8	5.14	887	5.30	967	5.51	1,080	5.70	1,170	5.88	1,270	5.80	1,220
12	5.17	902	5.38	1,010	5.71	1,180	5.80	1,220	5.97	1,320	5.94	1,300
	May 29		May 30		May 31		June 1		June 2		June 3	
4	5.88	1,270	5.53	1,080	5.33	983	5.38	1,010	5.66	1,150	5.82	1,240
8	5.77	1,210	5.43	1,040	5.24	937	5.29	962	5.50	1,070	5.92	1,290
N	5.69	1,160	5.35	994	5.17	902	5.22	927	5.42	1,030	5.94	1,300
4	5.62	1,130	5.31	972	5.17	902	5.24	937	5.40	1,020	5.83	1,240
8	5.60	1,120	5.34	988	5.31	972	5.47	1,060	5.63	1,140	5.82	1,240
12	5.61	1,120	5.39	1,010	5.41	1,020	5.70	1,170	5.77	1,210	5.80	1,220
	June 4		June 5		June 6		June 7		June 8		June 9	
4	5.74	1,190	5.72	1,180	5.72	1,180	5.75	1,200	5.72	1,180	5.70	1,170
8	5.68	1,160	5.64	1,140	5.65	1,140	5.68	1,160	5.67	1,160	5.55	1,100
N	5.58	1,110	5.50	1,070	5.52	1,080	5.53	1,080	5.57	1,100	5.42	1,030
4	5.56	1,103	5.50	1,070	5.52	1,080	5.53	1,080	5.55	1,100	5.40	1,020
8	5.69	1,160	5.69	1,160	5.73	1,190	5.71	1,180	5.70	1,170	5.58	1,110
12	5.77	1,210	5.76	1,200	5.85	1,250	5.76	1,203	5.75	1,200	5.70	1,170
	June 10		June 11		June 12		June 13		June 14		June 15	
4	5.54	1,090	5.33	983	5.07	852	4.97	802	4.81	723	4.68	661
8	5.38	1,010	5.20	917	4.98	807	4.90	767	4.74	689	4.63	638
N	5.27	952	5.11	872	4.90	767	4.84	738	4.67	656	4.55	602
4	5.21	922	5.08	857	4.85	742	4.82	728	4.62	633	4.52	589
8	5.33	983	5.12	877	4.98	807	4.87	752	4.69	665	4.60	624
12	5.43	1,040	5.17	902	5.02	827	4.88	757	4.72	680	4.65	647
	June 16		June 17		June 18		June 19		June 20		June 21	
4	4.55	602	4.39	534	4.28	489	4.27	485	4.20	458	4.32	505
8	4.49	576	4.34	513	4.24	474	4.20	458	4.14	435	4.30	497
N	4.45	559	4.30	497	4.21	462	4.16	443	4.10	420	4.31	501
4	4.40	538	4.30	497	4.22	466	4.13	431	4.12	428	4.35	518
8	4.40	538	4.37	526	4.35	518	4.16	443	4.27	485	4.34	513
12	4.45	559	4.34	513	4.35	518	4.29	493	4.39	534	4.28	489

Supplemental record.- May 25, 10 p.m., 5.69 ft., 1,160 sec.-ft.; May 26, 5 a.m., 5.52 ft., 1,080 sec.-ft.; May 27, 10:40 p.m., 5.99 ft., 1,330 sec.-ft.; June 3, 10 a.m., 5.97 ft., 1,320 sec.-ft.; June 9, 10 p.m., 5.70 ft., 1,170 sec.-ft.; June 18, 10 p.m., 4.40 ft., 538 sec.-ft.; June 19, 10 p.m., 4.29 ft., 493 sec.-ft.

## Johnson Creek near Landmark ranger station, Idaho

Location.- Lat. 44°41', long. 115°33', in sec. 31, T. 16 N., R. 8 E., 0.5 mile downstream from Bob Cat Creek, 0.8 mile upstream from Lunch Creek, 1½ miles north of Landmark ranger station, and 20 miles south of Yellow Pine.

Drainage area.- 54.7 square miles.

Gage-height record.- Water-stage recorder graph except 12:30 p.m. June 9 to 12:30 p.m. June 15 when there was no gage-height record.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 1,000 second-feet and extended to peak stage. Stage-discharge relation affected by ice May 1. Discharge for period of no gage-height record computed on basis of recorded range in stage and records for station at Yellow Pine. Shifting-control method used May 26-29, June 3, June 20 to July 31.

Maxima.- May-June 1948: Discharge, 1,510 second-feet 11 p.m. May 27 (gage height, 5.95 feet).

1942 to April 1948: Discharge, 1,240 second-feet May 8, 9, 1947 (gage height, 5.62 feet).

Remarks.- During late fall of 1936, the Bureau of Reclamation cut a transmountain canal to divert a small flow from a tributary of Johnson Creek to Deadwood River Basin to supplement storage in Deadwood Reservoir. Discharge measurement of July 16 indicated flow in this canal of 6.05 second-feet.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	72	927	176	11	119	640	77	21	716	355	48
2	69	1,010	155	12	129	560	75	22	674	289	44
3	70	1,180	154	13	165	540	69	23	637	252	42
4	68	949	118	14	174	470	63	24	757	226	40
5	72	896	110	15	196	410	60	25	902	210	39
6	88	894	100	16	266	395	56	26	998	194	36
7	132	881	93	17	382	349	53	27	1,120	181	39
8	138	850	86	18	508	325	52	28	1,240	165	49
9	127	796	82	19	672	314	53	29	1,140	155	44
10	119	700	75	20	714	299	52	30	925	148	39
								31	850		36
Monthly mean discharge, in second-feet									459	518	70.8
Runoff, in inches									9.67	10.57	1.49

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	3.58	349	4.00	494	4.26	600	4.50	715	4.58	757	4.47	700
8	3.55	336	3.96	479	4.32	627	4.42	675	4.48	705	4.42	675
N	3.51	323	3.92	464	4.38	656	4.40	665	4.41	670	4.35	642
4	3.66	372	3.99	490	4.48	705	4.43	680	4.44	695	4.37	651
8	3.95	476	4.17	562	4.59	763	4.61	774	4.49	710	4.42	675
12	4.04	510	4.27	605	4.57	752	4.65	796	4.54	736	4.39	660
	May 23		May 24		May 25		May 26		May 27		May 28	
4	4.31	623	4.46	695	4.79	877	5.02	1,020	5.13	1,100	5.70	1,310
8	4.23	597	4.37	651	4.66	802	4.87	926	4.95	978	5.58	1,220
N	4.21	578	4.35	642	4.66	802	4.82	895	4.87	926	5.15	1,100
4	4.30	618	4.48	705	4.75	854	4.82	895	5.02	1,020	5.18	1,130
8	4.50	715	4.80	893	5.05	1,040	5.14	1,100	5.79	1,580	5.66	1,280
12	4.55	742	4.91	952	5.17	1,120	5.55	1,190	5.92	1,480	5.79	1,380
	May 29		May 30		May 31		June 1		June 2		June 3	
4	5.65	1,270	5.05	1,040	4.80	883	4.96	984	5.18	1,130	5.60	1,230
8	5.29	1,210	4.89	939	4.71	830	4.85	914	5.01	1,020	5.64	1,260
N	5.07	1,060	4.78	871	4.63	785	4.73	842	4.67	926	5.59	1,220
4	5.02	1,020	4.72	836	4.63	785	4.71	830	4.80	883	5.25	1,170
8	5.08	1,060	4.77	865	4.78	871	4.88	933	4.89	939	5.14	1,100
12	5.14	1,100	4.83	902	4.96	984	5.18	1,130	5.23	1,170	5.12	1,090
	June 4		June 5		June 6		June 7		June 8		June 9	
4	5.07	1,060	4.96	984	4.96	984	4.95	978	4.85	914	4.79	877
8	4.95	978	4.98	933	4.88	933	4.87	926	4.81	889	4.75	842
N	4.84	908	4.77	865	4.77	865	4.75	854	4.73	842	4.64	790
4	4.76	859	4.68	813	4.68	813	4.67	807	4.66	802		
8	4.78	871	4.72	836	4.71	830	4.68	813	4.64	790		
12	4.90	945	4.89	939	4.88	933	4.80	883	4.74	848		
	June 10		June 11		June 12		June 13		June 14		June 15	
4												
8												
N											3.78	414
4											3.73	396
8											3.73	396
12											3.76	407
	June 16		June 17		June 18		June 19		June 20		June 21	
4	3.74	400	3.65	369	3.51	323	3.57	320	3.41	295	3.60	355
8	3.71	390	3.62	359	3.48	314	3.50	342	3.38	286	3.61	359
N	3.68	379	3.58	346	3.47	311	3.46	309	3.38	286	3.62	362
4	3.64	366	3.55	336	3.48	314	3.42	295	3.40	292	3.62	362
8	3.66	372	3.54	333	3.48	346	3.41	292	3.47	314	3.60	355
12	3.67	376	3.53	350	3.60	352	3.43	298	3.56	342	3.54	336

Supplemental record.- May 27, 11 p.m., 5.95 ft., 1,510 sec.-ft.; June 2, 2 a.m., 5.34 ft., 1,170 sec.-ft.

## Johnson Creek at Yellow Pine, Idaho

Location.- Lat. 44°58', long. 115°30', in NE $\frac{1}{4}$  sec. 29, T. 19 N., R. 8 E., 700 feet up-stream from mouth and a quarter of a mile southwest of Yellow Pine post office.

Drainage area.- 213 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 5,160 second-feet and extended to peak stage.

Maxima.- May-June 1948: Discharge, 4,620 second-feet 11:30 p.m. May 27 (gage height, 7.01 feet).

1928 to April 1948: Discharge, 5,150 second-feet June 9, 1933 (gage height, 7.62 feet), from rating curve extended above 2,800 second-feet.

Remarks.- Small diversion from Johnson Creek Basin to Deadwood River Basin (see Remarks for Station near Landmark ranger station).

## Mean discharge, in second-feet, 1948

mean discharge, in second-feet, 1940											
Day	May	June	July	Day	May	June	July	Day	May	June	July
1	307	3,040	861	11	450	2,610	401	21	2,090	1,480	250
2	285	3,420	759	12	468	2,280	388	22	2,040	1,280	237
3	296	4,070	671	13	655	2,230	359	23	1,840	1,140	224
4	300	3,280	610	14	710	1,960	338	24	2,050	1,060	215
5	289	3,270	560	15	759	1,820	311	25	2,580	981	208
6	367	3,480	515	16	969	1,650	292	26	2,990	915	202
7	570	3,520	501	17	1,340	1,500	278	27	3,460	855	205
8	570	3,450	450	18	1,660	1,420	271	28	3,920	814	244
9	496	3,240	427	19	2,200	1,390	271	29	3,610	776	237
10	454	2,890	405	20	2,160	1,320	264	30	2,910	748	212
								31	2,720		193
Monthly mean discharge, in second-feet.....									1,468	2,063	365
Runoff, in inches.....									7.95	10.81	1.98

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	3.83	1,300	4.35	1,700	4.66	1,970	5.00	2,300	4.98	2,280	4.80	2,100
8	3.74	1,230	4.22	1,600	4.76	2,060	4.78	2,080	4.80	2,100	4.79	2,090
N	3.64	1,160	4.10	1,500	4.89	2,190	4.66	1,970	4.65	1,960	4.70	2,010
4	3.71	1,210	4.12	1,520	4.96	2,260	4.67	1,980	4.63	1,950	4.66	1,970
8	4.22	1,600	4.48	1,810	5.16	2,460	4.95	2,250	4.73	2,040	4.68	1,990
12	4.44	1,780	4.66	1,970	5.15	2,450	5.07	2,370	4.80	2,100	4.66	1,970
	May 23		May 24		May 25		May 26		May 27		May 28	
4	4.58	1,900	4.68	1,990	5.26	2,570	5.76	3,120	5.99	3,380	6.73	4,270
8	4.44	1,780	4.57	1,890	5.05	2,350	5.51	2,840	5.74	3,090	6.32	3,770
N	4.35	1,700	4.45	1,780	4.90	2,200	5.31	2,620	5.53	2,860	5.99	3,380
4	4.35	1,700	4.55	1,880	5.03	2,330	5.41	2,730	5.75	3,100	6.08	3,490
8	4.63	1,950	5.11	2,410	5.72	3,070	5.89	3,260	6.71	4,240	6.62	4,130
12	4.75	2,060	5.36	2,680	5.88	3,250	6.17	3,590	6.99	4,600	6.85	4,420
	May 29		May 30		May 31		June 1		June 2		June 3	
4	6.71	4,240	5.84	3,200	5.48	2,810	5.72	3,070	6.12	3,530	6.53	4,030
8	6.30	3,750	5.63	2,970	5.32	2,630	5.53	2,860	5.89	3,260	6.76	4,300
N	5.92	3,290	5.42	2,740	5.16	2,460	5.33	2,640	5.66	3,010	6.68	4,210
4	5.80	3,160	5.33	2,640	5.20	2,500	5.41	2,730	5.70	3,050	6.50	3,990
8	5.96	3,340	5.49	2,820	5.58	2,920	6.13	3,550	6.36	3,820	6.47	3,950
12	5.98	3,370	5.58	2,920	5.76	3,120	6.28	3,730	6.50	3,990	6.35	3,810
	June 4		June 5		June 6		June 7		June 8		June 9	
4	6.09	3,500	5.94	3,320	6.16	3,580	6.20	3,630	6.16	3,580	6.02	3,410
8	5.86	3,230	5.77	3,130	5.93	3,310	6.00	3,390	5.98	3,370	5.83	3,190
N	5.70	3,050	5.60	2,940	5.73	3,080	5.78	3,140	5.81	3,170	5.63	2,970
4	5.68	3,030	5.68	3,030	5.74	3,090	5.83	3,190	5.79	3,150	5.60	2,940
8	5.91	3,280	6.18	3,610	6.44	3,920	6.41	3,880	6.21	3,640	5.99	3,380
12	6.06	3,460	6.33	3,790	6.50	3,990	6.40	3,870	6.25	3,690	5.96	3,340
	June 10		June 11		June 12		June 13		June 14		June 15	
4	5.74	3,090	5.47	2,800	5.11	2,410	5.02	2,320	4.80	2,100	4.57	1,890
8	5.55	2,880	5.29	2,600	4.98	2,280	4.95	2,250	4.66	1,970	4.50	1,830
N	5.36	2,680	5.15	2,450	4.84	2,140	4.85	2,150	4.56	1,880	4.41	1,750
4	5.28	2,590	5.12	2,420	4.76	2,060	4.82	2,120	4.49	1,820	4.35	1,700
8	5.61	2,950	5.28	2,590	5.00	2,300	4.92	2,220	4.58	1,900	4.49	1,820
12	5.65	3,000	5.28	2,590	5.07	2,370	4.92	2,220	4.64	1,960	4.51	1,840
	June 16		June 17		June 18		June 19		June 20		June 21	
4	4.42	1,760	4.18	1,560	4.03	1,450	4.04	1,460	3.90	1,350	4.07	1,480
8	4.32	1,680	4.10	1,500	3.96	1,400	3.95	1,390	3.82	1,290	4.08	1,480
N	4.23	1,600	4.05	1,460	3.90	1,350	3.87	1,330	3.77	1,250	4.08	1,480
4	4.17	1,560	4.04	1,460	3.90	1,350	3.82	1,290	3.73	1,230	4.09	1,490
8	4.17	1,560	4.08	1,480	4.08	1,480	3.90	1,350	3.88	1,340	4.10	1,500
12	4.25	1,620	4.10	1,500	4.12	1,520	3.99	1,420	4.06	1,470	4.04	1,460

## Johnson Creek at Yellow Pine, Idaho--Continued

Supplemental record:

May 17, 2 p.m., 3.62 ft., 1,150 sec.-ft.  
18, 2 p.m., 4.08 ft., 1,480 sec.-ft.  
19, 6 a.m., 4.68 ft., 1,990 sec.-ft.; 10 a.m., 4.88 ft., 2,180 sec.-ft.;  
10 p.m., 5.18 ft., 2,480 sec.-ft.  
21, 2 p.m., 4.60 ft., 1,920 sec.-ft.  
22, 2 a.m., 4.83 ft., 2,130 sec.-ft.  
26, 2 p.m., 5.28 ft., 2,590 sec.-ft.  
27, 1 p.m., 5.51 ft., 2,840 sec.-ft.; 11:30 p.m., 7.01 ft., 4,620 sec.-ft.  
31, 2 p.m., 5.13 ft., 2,430 sec.-ft.

June 1, 2 p.m., 5.29 ft., 2,600 sec.-ft.  
2, 2 p.m., 5.60 ft., 2,940 sec.-ft.; 9 p.m., 6.46 ft., 3,940 sec.-ft.  
3, 9 a.m., 6.78 ft., 4,330 sec.-ft.  
4, 2 p.m., 5.64 ft., 2,980 sec.-ft.; 11 p.m., 6.04 ft., 3,440 sec.-ft.  
5, 2 p.m., 5.56 ft., 2,900 sec.-ft.  
6, 2 p.m., 5.66 ft., 3,010 sec.-ft.; 10 p.m., 6.56 ft., 4,060 sec.-ft.  
7, 2 p.m., 5.73 ft., 3,080 sec.-ft.; 10 p.m., 6.46 ft., 3,940 sec.-ft.  
8, 2 p.m., 5.75 ft., 3,100 sec.-ft.; 10 p.m., 6.31 ft., 3,760 sec.-ft.  
9, 2 p.m., 5.56 ft., 2,900 sec.-ft.; 10 p.m., 6.04 ft., 3,440 sec.-ft.  
10, 3 p.m., 5.26 ft., 2,570 sec.-ft.; 10 p.m., 5.68 ft., 3,030 sec.-ft.  
11, 10 p.m., 5.32 ft., 2,630 sec.-ft.  
13, 10 p.m., 4.95 ft., 2,250 sec.-ft.  
19, 10 p.m., 4.01 ft., 1,430 sec.-ft.

## Secesh River near Burgdorf, Idaho

Location.- Lat. 45°14', long. 115°49', in N $\frac{1}{2}$  sec. 23, T. 22 N., R. 5 E., at highway bridge  $1\frac{1}{2}$  miles upstream from Long Gulch Creek and  $5\frac{1}{2}$  miles southeast of Burgdorf.

Drainage area.- 102 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below

970 second-feet and extended to peak stage on basis of slope-area measurement.

Shifting-control method used May 26 to June 2.

Maxima.- May-June 1948: Discharge, 2,500 second-feet 7:40 a.m. June 3 (gage height, 8.24 feet), by slope-area method.

1943 to April 1948: Discharge, 1,580 second-feet May 7, 1947 (gage height, 7.12 feet), from rating curve extended above 1,000 second-feet.

Remarks.- No regulation or appreciable diversion above station.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	212	1,550	614	11	234	1,460	284	21	1,100	1,140	180
2	194	1,630	539	12	253	1,340	266	22	1,240	976	165
3	194	2,080	483	13	331	1,390	247	23	1,210	849	156
4	183	1,610	436	14	354	1,310	233	24	1,310	805	151
5	176	1,540	407	15	397	1,260	221	25	1,420	761	144
6	245	1,580	374	16	530	1,230	209	26	1,500	700	140
7	347	1,620	352	17	760	1,120	197	27	1,590	660	144
8	312	1,650	329	18	917	1,060	197	28	1,640	632	179
9	264	1,580	302	19	1,080	1,010	205	29	1,660	605	191
10	237	1,570	287	20	1,080	990	204	30	1,530	587	156
								31	1,490		140
Monthly mean discharge, in second-feet									774	1,210	262
Runoff, in inches									8.75	13.23	2.96

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	5.64	677	6.04	894	6.13	947	6.30	1,050	6.37	1,100	6.67	1,300
8	5.56	637	5.93	832	6.23	1,010	6.20	989	6.26	1,030	6.67	1,300
N	5.53	623	5.90	815	6.37	1,100	6.15	959	6.21	995	6.59	1,240
4	5.89	810	6.09	923	6.48	1,170	6.36	1,090	6.41	1,130	6.56	1,220
8	6.18	977	6.31	1,060	6.52	1,190	6.54	1,210	6.52	1,190	6.55	1,220
12	6.14	953	6.22	1,000	6.43	1,140	6.50	1,180	6.52	1,190	6.47	1,160
	May 23		May 24		May 25		May 26		May 27		May 28	
4	6.42	1,130	6.65	1,280	6.83	1,400	6.97	1,500	7.22	1,580	7.34	1,670
8	6.36	1,090	6.53	1,200	6.72	1,330	6.90	1,450	7.15	1,520	7.27	1,620
N	6.35	1,080	6.47	1,160	6.66	1,290	6.84	1,410	7.10	1,480	7.21	1,570
4	6.60	1,250	6.69	1,310	6.85	1,420	6.94	1,480	7.20	1,560	7.25	1,600
8	6.85	1,420	6.95	1,480	7.08	1,580	7.22	1,580	7.36	1,690	7.35	1,680
12	6.79	1,370	6.93	1,470	7.04	1,550	7.29	1,630	7.42	1,740	7.38	1,710
	May 29		May 30		May 31		June 1		June 2		June 3	
4	7.41	1,730	7.20	1,560	7.16	1,530	7.21	1,570	7.32	1,660	7.59	1,910
8	7.36	1,690	7.15	1,520	7.09	1,480	7.12	1,500	7.23	1,580	8.24	2,500
N	7.29	1,650	7.09	1,480	7.01	1,420	7.05	1,450	7.17	1,540	7.87	2,210
4	7.26	1,610	7.09	1,480	7.00	1,420	7.09	1,480	7.19	1,550	7.73	2,020
8	7.27	1,620	7.17	1,540	7.15	1,520	7.28	1,620	7.37	1,700	7.66	1,930
12	7.25	1,600	7.19	1,550	7.25	1,600	7.38	1,710	7.50	1,820	7.59	1,840
	June 4		June 5		June 6		June 7		June 8		June 9	
4	7.48	1,710	7.36	1,570	7.41	1,620	7.46	1,680	7.52	1,750	7.43	1,650
8	7.40	1,610	7.30	1,500	7.34	1,540	7.38	1,590	7.42	1,630	7.36	1,570
N	7.34	1,540	7.25	1,450	7.27	1,470	7.32	1,520	7.36	1,570	7.29	1,490
4	7.30	1,500	7.25	1,450	7.27	1,470	7.29	1,490	7.34	1,540	7.26	1,460
8	7.35	1,560	7.41	1,620	7.43	1,650	7.44	1,660	7.41	1,620	7.39	1,600
12	7.39	1,600	7.49	1,720	7.53	1,770	7.60	1,850	7.48	1,710	7.52	1,750
	June 10		June 11		June 12		June 13		June 14		June 15	
4	7.49	1,720	7.35	1,560	7.21	1,410	7.23	1,430	7.20	1,400	7.10	1,310
8	7.38	1,590	7.28	1,480	7.15	1,360	7.24	1,440	7.13	1,340	7.09	1,300
N	7.30	1,500	7.23	1,430	7.09	1,300	7.18	1,380	7.07	1,280	7.03	1,250
4	7.25	1,450	7.19	1,390	7.04	1,280	7.11	1,320	7.02	1,240	6.98	1,200
8	7.30	1,500	7.19	1,390	7.08	1,290	7.18	1,380	7.03	1,250	7.01	1,230
12	7.37	1,560	7.22	1,420	7.15	1,360	7.23	1,430	7.09	1,300	7.08	1,290
	June 16		June 17		June 18		June 19		June 20		June 21	
4	7.10	1,310	6.95	1,180	6.85	1,100	6.79	1,050	6.73	1,010	6.85	1,100
8	7.04	1,260	6.90	1,140	6.81	1,070	6.74	1,020	6.67	969	6.87	1,120
N	6.98	1,200	6.85	1,100	6.75	1,020	6.69	983	6.63	941	6.92	1,160
4	6.96	1,190	6.84	1,090	6.74	1,020	6.66	962	6.65	955	6.96	1,190
8	6.95	1,180	6.84	1,090	6.79	1,050	6.68	976	6.75	1,020	6.92	1,160
12	6.97	1,200	6.85	1,100	6.81	1,070	6.73	1,010	6.83	1,080	6.84	1,090

Supplemental record.- June 3, 3 a.m., 7.50 ft., 1,820 sec.-ft., 6 a.m., 7.99 ft., 2,410 sec.-ft., 9 a.m., 7.66 ft., 2,190 sec.-ft.

## Warren Creek near Warren, Idaho

Location.- Lat. 45°17', long. 115°42', in sec. 3, T. 22 N., R. 6 E., 30 feet downstream from bridge on Warren-McCall road, a tenth of a mile downstream from Steamboat Creek, and 1.3 miles northwest of Warren.

Drainage area.- 37 square miles.

Gage-height record.- Water-stage recorder graph prior to May 25; staff gage at site 75 feet downstream read once daily thereafter except periods May 26 to June 11, June 23 to July 5, when there was no gage-height record.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 490 second-feet and extended to peak stage on basis of slope-area measurement. Discharge for periods of no gage-height record computed on basis of records for Secesh River near Burgdorf and Johnson Creek at Yellow Pine. Shifting-control method used May 1-25.

Maxima.- May-June 1948: Discharge, 1,100 second-feet June 3 (gage height, 5.3 feet, from floodmarks), by slope-area method.

1943 to April 1948: Discharge observed, 790 second-feet May 27, 1943 (gage height, 5.37 feet, site then in use), from rating curve extended above 350 second-feet.

Remarks.- No diversion or regulation above station. Small amount of flow bypasses station through debris from dredging operations.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	59	580	140	11	71	450	74	21	427	235	44
2	54	640	125	12	71	393	60	22	450	198	39
3	52	750	110	13	92	384	58	23	442	180	36
4	50	600	100	14	102	346	54	24	469	165	34
5	51	560	93	15	128	318	51	25	517	155	34
6	76	600	86	16	192	302	48	26	570	140	34
7	109	620	84	17	296	265	48	27	620	135	38
8	99	600	74	18	364	240	50	28	680	130	50
9	86	560	69	19	409	216	56	29	620	125	41
10	77	500	65	20	432	216	48	30	580	120	33
								31	550		32
Monthly mean discharge, in second-feet									284	357	61.5
Runoff, in inches									8.84	10.78	1.92

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	4.11	260	4.50	350	4.60	373	4.83	426	4.83	426	5.00	465
8	4.10	258	4.49	348	4.70	396	4.80	419	4.77	412	4.92	446
N	4.14	267	4.49	348	4.70	396	4.78	414	4.74	405	4.91	444
4	4.39	324	4.61	375	4.89	440	4.91	444	4.88	437	4.94	451
8	4.53	357	4.69	394	4.89	440	4.95	453	4.89	440	4.94	451
12	4.52	354	4.64	382	4.88	437	4.89	440	4.89	440	4.89	440
	May 23		May 24		May 25		May 26		May 27		May 28	
4	4.86	433	4.92	446	5.08	483						
8	4.82	423	4.89	440	5.02	469						
N	4.80	419	4.87	435	5.02	469						
4	4.96	456	5.10	488	5.28	529						
8	5.04	474	5.27	527	5.62	607						
12	4.97	458	5.15	499	5.54	589						

## Mud Creek near Tamarack, Idaho

Location.- Lat. 45°00', long. 116°21', in sec. 9, T. 19 N., R. 1 E., 0.5 mile upstream from Little Mud Creek,  $3\frac{1}{4}$  miles northeast of Tamarack, and 5 miles upstream from mouth.

Drainage area.- 15.8 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 136 second-feet and extended to peak stage on basis of shape of former curve defined below 286 second-feet.

Maxima.- May-June 1948: Discharge, 204 second-feet 12 m. May 7 (gage height, 4.12 feet).

1937-38, 1945 to April 1948: Discharge observed, about 300 second-feet probably on May 1, 1938 (gage height, 3.34 feet, from floodmark, site and datum then in use).

Remarks.- No diversion or regulation above station.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	116	44	9.1	11	110	24	5.4	21	124	14	4.0
2	98	39	8.2	12	108	22	5.2	22	145	14	3.8
3	103	72	7.0	13	121	22	4.7	23	126	12	3.6
4	123	54	6.7	14	136	19	4.4	24	118	11	3.4
5	121	46	6.5	15	136	19	4.2	25	112	10	3.4
6	146	40	6.0	16	140	19	4.2	26	107	9.4	3.1
7	198	35	6.0	17	159	18	4.2	27	99	8.8	3.4
8	185	31	5.7	18	157	18	4.2	28	88	8.2	4.2
9	151	28	5.4	19	153	18	4.2	29	76	7.3	4.0
10	127	26	5.2	20	136	16	4.2	30	64	7.6	3.6
								31	52		3.8
Monthly mean discharge, in second-feet .....									124	23.7	4.87
Runoff, in inches .....									9.03	1.67	0.36

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	3.90	159	3.92	163	3.91	161	3.82	144	3.74	129	3.87	153
8	3.90	159	3.89	157	3.89	157	3.78	136	3.72	125	3.92	163
N	3.88	155	3.85	150	3.85	150	3.76	132	3.70	121	3.82	144
4	3.88	155	3.86	151	3.85	150	3.74	129	3.70	121	3.79	138
8	3.92	163	3.90	159	3.85	150	3.76	132	3.70	121	3.79	138
12	3.93	165	3.89	157	3.84	148	3.76	132	3.71	123	3.76	132
	May 23		May 24		May 25		May 26		May 27		May 28	
4	3.74	129	3.70	121	3.67	116	3.65	112	3.60	103	3.54	93
8	3.73	127	3.69	119	3.66	114	3.63	108	3.59	101	3.53	92
N	3.71	123	3.67	116	3.64	110	3.62	107	3.57	98	3.50	87
4	3.70	121	3.66	114	3.63	108	3.60	103	3.55	95	3.48	84
8	3.72	125	3.68	117	3.65	112	3.61	105	3.56	97	3.47	82
12	3.72	125	3.68	117	3.65	112	3.61	105	3.55	95	3.47	82
	May 29		May 30		May 31		June 1		June 2		June 3	
4	3.47	82	3.36	66	3.28	56	3.21	47	3.15	42	3.25	52
8	3.44	78	3.35	65	3.27	54	3.20	46	3.14	41	3.69	119
N	3.42	75	3.34	64	3.25	52	3.19	45	3.13	40	3.47	82
4	3.40	72	3.32	61	3.23	50	3.16	42	3.10	37	3.38	69
8	3.39	71	3.33	62	3.22	48	3.16	42	3.09	36	3.33	62
12	3.38	69	3.31	59	3.22	48	3.15	42	3.09	36	3.31	59
	June 4		June 5		June 6		June 7		June 8		June 9	
4	3.29	57	3.22	48	3.16	42	3.10	37	3.04	32	3.00	30
8	3.28	56	3.21	47	3.16	42	3.10	37	3.04	32	2.99	29
N	3.27	54	3.20	46	3.14	41	3.09	36	3.04	32	2.99	29
4	3.25	52	3.18	44	3.11	38	3.06	34	3.02	31	2.97	28
8	3.23	50	3.16	42	3.09	36	3.04	32	3.00	30	2.95	26
12	3.23	50	3.16	42	3.09	36	3.04	32	2.99	29	2.95	26
	June 10		June 11		June 12		June 13		June 14		June 15	
4	2.95	26	2.92	25	2.89	23	2.88	22	2.82	20	2.79	18
8	2.95	26	2.93	25	2.89	23	2.88	22	2.82	20	2.79	18
N	2.95	26	2.93	25	2.89	23	2.87	22	2.82	20	2.79	18
4	2.93	25	2.91	24	2.86	22	2.86	22	2.80	18	2.78	18
8	2.92	25	2.89	23	2.85	21	2.85	21	2.79	18	2.77	17
12	2.91	24	2.89	23	2.86	22	2.82	20	2.79	18	2.77	17
	June 16		June 17		June 18		June 19		June 20		June 21	
4	2.77	17	2.80	18	2.78	18	2.78	18	2.78	18	2.70	14
8	2.76	18	2.79	18	2.78	18	2.76	17	2.78	18	2.72	15
N	2.83	20	2.78	18	2.76	17	2.76	17	2.77	17	2.73	15
4	2.86	22	2.78	18	2.76	17	2.75	17	2.74	16	2.73	15
8	2.82	20	2.78	18	2.80	18	2.78	18	2.67	13	2.71	14
12	2.83	20	2.78	18	2.80	18	2.78	18	2.67	13	2.70	14

Supplemental record.- May 22, 6 a.m., 3.95 ft., 169 sec.-ft.; June 3, 2 a.m., 3.13 ft., 40 sec.-ft., 6 a.m., 3.50 ft., 87 sec.-ft., 10 a.m., 3.63 ft., 108 sec.-ft.



## Grande Ronde River Basin

Grande Ronde River near Hilgard, Oreg.

Location.- Lat. 45°19', long. 118°16', near center of sec. 11, T. 3 S., R. 36 E., three-quarters of a mile upstream from Spring Creek and 3 miles southwest of Hilgard.

Drainage area.- 489 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge, 3,300 second-feet 3:30 a.m. May 28 (gage height, 5.26 feet).

1937 to April 1948: Discharge, 3,240 second-feet Dec. 12, 1946 (gage height, 5.22 feet).

Remarks.- Small diversions above station for irrigation.

## Mean discharge, in second-feet, 1948

Monthly mean discharge, in second-feet											
Day	May	June	July	Day	May	June	July	Day	May	June	July
1	910	1,760	340	11	1,550	1,170	191	21	2,220	958	119
2	822	1,870	308	12	1,470	1,010	180	22	2,970	872	110
3	822	1,950	288	13	2,060	926	163	23	2,910	795	104
4	998	2,480	272	14	2,020	874	152	24	2,720	715	102
5	946	1,960	312	15	1,730	797	142	25	2,700	635	93
6	1,070	1,810	276	16	1,770	762	136	26	2,750	573	87
7	1,670	1,650	264	17	2,020	702	129	27	2,980	510	87
8	1,740	1,550	233	18	1,920	735	132	28	2,990	456	104
9	1,800	1,440	214	19	2,160	933	123	29	2,340	412	96
10	1,640	1,360	195	20	2,110	843	132	30	1,930	376	87
								31	1,850		82
Monthly mean discharge, in second-feet									1,922	1,096	169
Runoff, in inches									4.53	2.50	0.40

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	4.40	2,050	4.34	1,970	4.56	2,270	4.50	2,190	4.50	2,190	4.98	2,880
8			4.32	1,950	4.56	2,270	4.48	2,160	4.52	2,220	5.05	2,980
N			4.30	1,920	4.45	2,120	4.44	2,110	4.48	2,160	5.10	3,060
4	4.41	2,060	4.25	1,860	4.41	2,060	4.40	2,050	4.44	2,110	5.08	3,030
8			4.24	1,840	4.45	2,120	4.36	2,000	4.56	2,270	5.08	3,030
12	4.36	2,000	4.37	2,010	4.51	2,200	4.44	2,110	4.83	2,660	5.10	3,060
	May 23		May 24		May 25		May 26		May 27		May 28	
4	5.10	3,060	4.96	2,850	4.95	2,840	4.92	2,790	5.14	3,120	5.25	3,280
8	5.12	3,090	4.94	2,820	4.91	2,780	4.90	2,760	5.07	3,020	5.16	3,150
N	5.02	2,940	4.88	2,730	4.84	2,670	4.86	2,700	4.98	2,880	5.04	2,970
4	4.90	2,760	4.81	2,620	4.78	2,580	4.81	2,620	4.94	2,820	4.98	2,880
8	4.87	2,720	4.78	2,580	4.80	2,610	4.87	2,720	5.02	2,940	4.89	2,740
12	4.90	2,760	4.89	2,740	4.89	2,740	5.11	3,080	5.17	3,160	4.84	2,670
	May 29		May 30		May 31		June 1		June 2		June 3	
4	4.76	2,550	4.39	2,040	4.37	2,010	4.27	1,880	4.36	2,000	4.37	2,010
8	4.67	2,430	4.36	2,000	4.30	1,920	4.23	1,830	4.35	1,980	4.31	1,930
N	4.61	2,340	4.32	1,950	4.21	1,800	4.16	1,740	4.25	1,860	4.23	1,830
4	4.51	2,200	4.21	1,800	4.16	1,740	4.09	1,660	4.17	1,750	4.15	1,730
8	4.44	2,110	4.20	1,790	4.17	1,750	4.08	1,650	4.18	1,770	4.30	1,920
12	4.43	2,090	4.27	1,880	4.23	1,830	4.21	1,800	4.34	1,970	4.80	2,610
	June 4		June 5		June 6		June 7		June 8		June 9	
4	5.04	2,970	4.42	2,080	4.34	1,970	4.21	1,800	4.08	1,650	3.98	1,540
8	4.80	2,610	4.36	2,000	4.25	1,860	4.12	1,690	4.00	1,560	3.88	1,440
N	4.68	2,440	4.30	1,920	4.16	1,740	4.04	1,600	3.93	1,490	3.80	1,360
4	4.57	2,290	4.24	1,840	4.10	1,670	3.97	1,530	3.92	1,480	3.75	1,320
8	4.51	2,200	4.25	1,860	4.10	1,670	3.98	1,540	3.94	1,500	3.80	1,360
12	4.48	2,160	4.36	2,000	4.25	1,860	4.06	1,630	4.05	1,620	4.03	1,590
	June 10		June 11		June 12		June 13		June 14		June 15	
4	4.00	1,560	3.64	1,220	3.46	1,080	3.29	964	3.25	940	3.06	833
8	3.85	1,410	3.59	1,180	3.40	1,040	3.24	934	3.17	894	3.01	806
N	3.74	1,310	3.52	1,130	3.34	998	3.19	904	3.10	855	2.96	780
4	3.66	1,240	3.50	1,110	3.27	952	3.14	877	3.04	822	2.93	765
8	3.63	1,210	3.60	1,190	3.25	940	3.22	922	3.07	838	2.93	765
12	3.66	1,240	3.54	1,140	3.29	964	3.25	940	3.08	844	3.04	822
	June 16		June 17		June 18		June 19		June 20		June 21	
4	2.98	790	2.88	740	2.90	750	3.38	1,030	3.04	822	3.30	970
8	2.92	760	2.83	715	2.83	715	3.40	1,040	3.00	800	3.35	1,000
N	2.94	770	2.79	695	2.81	705	3.28	958	3.02	811	3.32	984
4	2.89	745	2.74	670	2.82	710	3.17	894	3.08	844	3.25	940
8	2.86	730	2.71	655	2.90	750	3.08	844	3.17	894	3.23	928
12	2.87	735	2.87	735	3.05	828	3.06	833	3.26	946	3.20	910

Supplemental record.- May 28, 3:30 a.m., 5.26 ft., 3,300 sec.-ft.

## Grande Ronde River at La Grande, Oreg.

Location.- Lat. 45°21', long. 118°08', in sec. 36, (revised) T. 2 S., R. 37 E., 2 miles (revised) northwest of La Grande and 4 miles downstream from Fivepoint Creek. Datum of gage is 2,831.25 feet above mean sea level, datum of 1929.

Drainage area.- 678 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge, 4,620 second-feet 9 p.m. May 22 (gage height, 7.04 feet).

1903-15, 1918-23, 1925 to April 1948: Discharge, 8,880 second-feet Mar. 18, 1932 (gage height, 8.90 feet).

Remarks.- Small diversions above station for irrigation.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,380	2,160	420	11	2,290	1,430	226	21	3,000	1,240	138
2	1,240	2,240	375	12	2,160	1,280	214	22	4,350	1,150	124
3	1,230	2,280	340	13	2,770	1,140	192	23	4,240	1,030	111
4	1,500	2,790	317	14	2,790	1,090	182	24	3,770	917	111
5	1,410	2,260	360	15	2,470	991	169	25	3,750	814	106
6	1,560	2,080	330	16	2,530	964	156	26	3,740	723	98
7	2,360	1,920	312	17	2,810	869	149	27	3,820	650	98
8	2,490	1,790	274	18	2,660	904	149	28	3,730	573	119
9	2,680	1,720	250	19	3,020	1,170	149	29	2,940	518	116
10	2,450	1,630	230	20	3,000	1,050	153	30	2,460	465	104
								31	2,510		91
Monthly mean discharge, in second-feet.....									2,675	1,328	199
Runoff, in inches.....									4.55	2.19	0.34

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	5.60	2,790	5.55	2,730	5.82	3,050	5.86	3,100	5.76	2,980	6.57	4,010
8	5.63	2,830	5.51	2,680	5.89	3,140	5.83	3,070	5.78	3,010	6.85	4,350
N	5.64	2,840	5.47	2,640	5.80	3,030	5.76	2,980	5.75	2,970	6.89	4,560
4	5.66	2,860	5.43	2,590	5.76	2,980	5.70	2,910	5.72	2,930	7.03	4,610
8	5.62	2,810	5.40	2,550	5.79	3,020	5.69	2,900	5.71	2,920	7.00	4,570
12	5.58	2,770	5.58	2,770	5.85	3,090	5.74	2,960	6.10	3,400	6.96	4,520
	May 23		May 24		May 25		May 26		May 27		May 28	
4	6.97	4,530	6.49	3,910	6.45	3,860	6.45	3,860	6.55	3,980	6.62	4,080
8	6.90	4,440	6.50	3,920	6.45	3,860	6.43	3,830	6.52	3,950	6.51	3,930
N	6.78	4,280	6.39	3,780	6.37	3,750	6.34	3,710	6.42	3,820	6.35	3,720
4	6.62	4,080	6.26	3,610	6.28	3,630	6.27	3,620	6.30	3,660	6.26	3,610
8	6.50	3,920	6.25	3,600	6.30	3,660	6.31	3,670	6.30	3,660	6.15	3,460
12	6.50	3,920	6.33	3,700	6.39	3,780	6.41	3,800	6.47	3,880	6.04	3,320
	May 29		May 30		May 31		June 1		June 2		June 3	
4	5.94	3,200	5.44	2,600	5.31	2,440	5.16	2,260	5.17	2,270	5.26	2,380
8	5.83	3,070	5.38	2,530	5.29	2,420	5.17	2,270	5.28	2,410	5.22	2,330
N	5.72	2,930	5.34	2,480	5.19	2,300	5.08	2,170	5.17	2,270	5.13	2,230
4	5.60	2,790	5.24	2,360	5.12	2,210	4.99	2,070	5.08	2,170	5.05	2,140
8	5.50	2,670	5.17	2,270	5.11	2,200	4.95	2,020	5.05	2,140	5.06	2,150
12	5.48	2,650	5.22	2,330	5.11	2,200	5.02	2,100	5.14	2,240	5.45	2,610
	June 4		June 5		June 6		June 7		June 8		June 9	
4	5.93	3,190	5.29	2,420	5.16	2,260	5.02	2,100	4.83	1,890	4.76	1,820
8	5.81	3,040	5.21	2,320	5.09	2,180	4.95	2,020	4.77	1,830	4.64	1,700
N	5.61	2,800	5.14	2,240	5.00	2,080	4.85	1,920	4.67	1,730	4.56	1,620
4	5.48	2,650	5.06	2,150	4.90	1,970	4.75	1,810	4.66	1,720	4.58	1,640
8	5.38	2,530	5.02	2,100	4.85	1,920	4.70	1,760	4.72	1,780	4.61	1,670
12	5.34	2,480	5.10	2,190	4.91	1,980	4.75	1,810	4.76	1,820	4.78	1,840
	June 10		June 11		June 12		June 13		June 14		June 15	
4	4.82	1,880	4.38	1,450	4.31	1,390	4.05	1,170	4.05	1,170	3.88	1,040
8	4.66	1,720	4.33	1,410	4.23	1,320	4.03	1,150	4.01	1,140	3.85	1,020
N	4.53	1,590	4.27	1,350	4.16	1,260	3.98	1,110	3.95	1,090	3.80	980
4	4.42	1,490	4.32	1,400	4.10	1,210	4.00	1,130	3.88	1,040	3.77	959
8	4.37	1,440	4.39	1,460	4.03	1,150	4.00	1,130	3.86	1,020	3.73	931
12	4.38	1,450	4.42	1,490	4.02	1,150	4.05	1,170	3.88	1,040	3.82	994
	June 16		June 17		June 18		June 19		June 20		June 21	
4	3.84	1,010	3.71	917	3.72	924	4.12	1,230	3.86	1,020	4.14	1,240
8	3.80	980	3.68	896	3.67	889	4.22	1,310	3.84	1,010	4.16	1,260
N	3.78	966	3.64	868	3.63	861	4.13	1,230	3.83	1,000	4.19	1,280
4	3.77	959	3.60	840	3.65	875	4.02	1,150	3.88	1,040	4.14	1,240
8	3.71	917	3.57	820	3.73	931	3.92	1,070	3.97	1,110	4.10	1,210
12	3.70	910	3.59	834	3.91	1,060	3.88	1,040	4.06	1,180	4.08	1,190

Supplemental record.- May 22, 9 p.m. 7.04 ft., 4,620 sec.-ft.; June 9, 2 a.m., 4.80 ft., 1,860 sec.-ft.; June 11, 10 p.m., 4.50 ft., 1,560 sec.-ft.

## Grande Ronde River at Rondowa, Oreg.

Location.- Lat. 45°44', long. 117°47', in NW¼ sec. 23, T. 3 N., R. 40 E., at Rondowa, 500 feet downstream from Wallowa River. Datum of gage is 2,281.4 feet above mean sea level, datum of 1929 (Union Pacific System track profile).

Drainage area.- 2,555 square miles.

Gage-height record.- Water-stage recorder graph except for periods of faulty float operation 4 a.m. to 8 a.m. May 28, 12 p.m. June 3 to 8 p.m. June 5, 8 a.m. to 8 p.m. June 6, record for which was computed on basis of shape of graph as recorded and floodmark in well.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 13,400 second-feet.

Maxima.- May-June 1948: Discharge, 19,900 second-feet 2 a.m. May 28 (gage height, 9.76 feet, from floodmark in well).

1926 to April 1948: Discharge, 18,300 second-feet (revised) Mar. 18, 1932 (gage height, 9.30 feet).

Remarks.- Many diversions above station for irrigation. Flow slightly regulated by Wallowa Lake Reservoir.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	5,380	12,700	5,400	11	7,260	12,100	2,540	21	12,000	8,320	1,580
2	5,040	13,500	4,730	12	6,960	10,700	2,530	22	13,000	7,540	1,480
3	5,080	14,000	4,100	13	7,420	9,760	2,320	23	13,300	6,940	1,420
4	5,640	13,000	3,710	14	7,520	9,300	2,150	24	14,500	6,750	1,360
5	5,340	12,500	3,530	15	7,540	9,510	2,020	25	15,600	6,510	1,290
6	5,580	13,100	3,230	16	7,880	9,000	1,900	26	16,500	6,040	1,210
7	7,520	13,400	3,080	17	8,980	8,080	1,790	27	17,800	5,780	1,160
8	7,520	13,800	2,830	18	8,900	7,550	1,710	28	18,500	5,820	1,210
9	7,540	13,800	2,640	19	11,200	7,760	1,700	29	15,500	5,700	1,220
10	7,470	13,400	2,540	20	12,000	7,810	1,670	30	13,300	5,700	1,160
								31	12,500		1,110
Monthly mean discharge, in second-feet									10,010	9,662	2,268
Runoff, in inches									4.52	4.22	1.02

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Discharge		Discharge		Discharge		Discharge		Discharge		Discharge	
	Gage height		Gage height		Gage height		Gage height		Gage height		Gage height	
	May 17		May 18		May 19		May 20		May 21		May 22	
4	6.23	9,130	6.16	8,940	6.65	10,300	7.41	12,400	7.35	12,300	7.47	12,600
8	6.23	9,130	6.15	8,920	7.09	11,500	7.31	12,100	7.28	12,100	7.60	13,000
N	6.19	9,020	6.13	8,860	7.19	11,800	7.21	11,900	7.21	11,900	7.71	13,300
4	6.14	8,890	6.09	8,750	7.08	11,500	7.15	11,700	7.15	11,700	7.72	13,400
8	6.12	8,830	6.10	8,780	7.09	11,500	7.18	11,800	7.14	11,700	7.65	13,200
12	6.14	8,890	6.32	9,370	7.30	12,100	7.31	12,100	7.25	12,000	7.64	13,100
	May 23		May 24		May 25		May 26		May 27		May 28	
4	7.64	13,100	8.15	14,700	8.51	15,800	8.80	16,700	9.21	18,000	9.74	19,800
8	7.64	13,100	8.07	14,400	8.43	15,500	8.72	16,500	9.12	17,700	9.58	19,300
N	7.62	13,100	7.96	14,100	8.31	15,200	8.58	16,000	9.00	17,400	9.39	18,600
4	7.65	13,200	7.92	14,000	8.25	15,000	8.56	15,900	8.92	17,100	9.18	17,900
8	7.84	13,700	8.12	14,600	8.47	15,700	8.78	16,600	9.28	18,300	9.01	17,400
12	8.08	14,400	8.44	15,600	8.79	16,700	9.15	17,800	9.66	19,500	8.86	16,900
	May 29		May 30		May 31		June 1		June 2		June 3	
4	8.72	16,500	7.93	14,000	7.58	12,900	7.59	13,000	7.84	13,700	8.18	14,800
8	8.55	15,900	7.78	13,500	7.47	12,600	7.50	12,700	7.77	13,500	8.07	14,400
N	8.38	15,400	7.63	13,100	7.33	12,200	7.38	12,400	7.64	13,100	7.94	14,000
4	8.21	14,900	7.49	12,700	7.24	11,900	7.30	12,100	7.59	13,000	7.79	13,600
8	8.09	14,500	7.52	12,800	7.33	12,200	7.48	12,600	7.82	13,700	7.70	13,300
12	8.02	14,300	7.61	13,000	7.57	12,900	7.77	13,500	8.14	14,600	7.74	13,400
	June 4		June 5		June 6		June 7		June 8		June 9	
4	7.77	13,500	7.57	12,900	7.66	13,200	7.77	13,500	8.03	14,200	8.06	14,400
8	7.72	13,400	7.52	12,800	7.76	13,500	7.81	13,600	7.86	13,800	7.91	13,900
N	7.59	13,000	7.42	12,500	7.69	13,300	7.71	13,300	7.76	13,500	7.73	13,400
4	7.45	12,600	7.31	12,100	7.54	12,800	7.58	12,900	7.68	13,200	7.58	12,900
8	7.41	12,400	7.34	12,200	7.55	12,800	7.76	13,500	7.89	13,900	7.81	13,600
12	7.50	12,700	7.50	12,700	7.65	13,200	7.96	14,100	8.11	14,500	8.13	14,600
	June 10		June 11		June 12		June 13		June 14		June 15	
4	8.11	14,500	7.51	12,700	7.09	11,500	6.60	10,100	6.45	9,720	6.31	9,350
8	7.88	13,800	7.41	12,400	6.92	11,000	6.50	9,860	6.36	9,480	6.57	10,100
N	7.68	13,200	7.30	12,100	6.78	10,600	6.41	9,620	6.23	9,130	6.41	9,620
4	7.51	12,700	7.17	11,700	6.61	10,200	6.33	9,400	6.12	8,830	6.23	9,130
8	7.47	12,600	7.12	11,600	6.63	9,940	6.41	9,620	6.23	9,130	6.36	9,480
12	7.52	12,800	7.18	11,800	6.63	10,200	6.46	9,750	6.30	9,320	6.33	9,400
	June 16		June 17		June 18		June 19		June 20		June 21	
4	6.33	9,400	5.98	8,470	5.70	7,760	5.76	7,910	5.80	8,010	5.79	7,980
8	6.29	9,290	5.91	8,290	5.62	7,570	5.71	7,730	5.75	7,880	5.92	8,310
N	6.20	9,050	5.82	8,060	5.57	7,540	5.66	7,660	5.69	7,740	6.11	8,810
4	6.08	8,730	5.72	7,810	5.50	7,280	5.64	7,620	5.66	7,660	6.02	8,570
8	6.00	8,520	5.67	7,690	5.56	7,420	5.66	7,660	5.67	7,690	5.92	8,310
12	6.02	8,570	5.72	7,810	5.73	7,840	5.78	7,980	5.71	7,780	5.82	8,060

Supplemental record.- May 28, 2 a.m., 9.76 ft., 19,900 sec.-ft.

## Grande Ronde River at Troy, Oreg.

Location.- Lat. 45°57', long. 117°27', in NW $\frac{1}{4}$  sec. 4, T. 5 N., R. 45 E., at bridge at Troy, 100 feet downstream from Wenaha River.

Drainage area.- 3,275 square miles.

Gage-height record.- Wire-weight gage read once daily except May 6, 30, 31, June 6, July 1, when there was no gage-height record. Doubtful reading May 4.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Discharge for days of doubtful or no gage-height record computed on basis of records for station at Rondowa.

Maxima.- May-June 1948: Discharge, 23,600 second-feet May 27 (gage height, 22.15 feet, from floodmarks).

1944 to April 1948: Discharge observed, 26,500 second-feet Dec. 15, 1946 (gage height, 23.20 feet).

Remarks.- Many diversions above station for irrigation. Flow slightly regulated by Wallowa Lake and Minam Lake Reservoirs.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	8,090	14,700	7,000	11	11,200	14,400	3,190	21	17,400	10,400	1,920
2	7,670	15,700	6,880	12	10,900	14,000	3,020	22	17,600	9,330	1,850
3	7,160	16,400	6,570	13	11,800	11,200	2,830	23	16,700	8,670	1,800
4	8,500	15,000	6,310	14	11,300	11,200	2,700	24	18,000	8,280	1,730
5	8,280	14,700	5,640	15	11,100	11,500	2,490	25	19,500	8,030	1,710
6	8,800	15,300	4,060	16	12,000	11,300	2,290	26	20,900	7,670	1,660
7	12,300	15,300	3,580	17	12,700	10,500	2,120	27	22,800	7,440	1,620
8	12,000	15,500	3,500	18	12,600	9,600	2,070	28	22,200	7,270	1,600
9	11,900	16,000	3,360	19	16,300	9,670	1,990	29	18,700	6,830	1,560
10	11,600	15,000	3,290	20	17,100	9,810	1,940	30	16,000	7,160	1,520
								31	15,000		1,480
Monthly mean discharge, in second-feet .....									13,820	11,600	3,009
Runoff, in inches .....									4.86	3.95	1.06

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
8 a	May 17 19.94	12,700	8 a	May 25 21.40	19,500	1 p	June 4 20.50	15,000	3p	June 14 19.54	11,200
8 a	May 18 19.92	12,600	7:30 a	May 26 21.66	20,900	8 a	June 5 20.42	14,700	2p	June 15 19.64	11,500
11:30 a	May 19 20.78	16,300	7:35 a 9:15 a	May 27 22.00 21.90	22,800 22,200	10:30 a	June 7 20.56	15,300	8 a	June 16 19.58	11,300
10 a	May 20 20.98	17,300	8 a	May 28 21.90	22,200	8 a	June 8 20.60	15,500	8 a	June 17 19.56	10,500
8 a	May 21 21.00	17,400	8 a	May 29 21.26	18,700	7 a	June 9 20.70	16,000	8 a	June 18 19.10	9,600
5:30 p	May 22 21.04	17,600	6 a	June 1 20.42	14,700	8 a	June 10 20.50	15,000	8 a	June 19 19.12	9,670
11 a	May 23 20.86	16,700	12:35 p	June 2 20.64	15,700	8 a	June 11 20.36	14,400	3p	June 20 19.16	9,810
8 a	May 24 21.12	18,000	6 p	June 3 20.80	16,400	8 a	June 12 20.26	14,000	8 a	June 21 19.34	10,400
						2:30 p	June 13 19.56	11,200			

## Catherine Creek near Union, Oreg.

Location.- Lat. 45°09', long. 117°47', in SE $\frac{1}{4}$  sec. 2, T. 5 S., R. 40 E., 3 miles downstream from Little Catherine Creek and 6 miles southeast of Union. Datum of gage is 3,082.11 feet above mean sea level, datum of 1929.

Drainage area.- 105 square miles.

Gage-height record.- Water-stage recorder graph; gage-height record doubtful from about May 29 to 3:30 p.m. June 1.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge, 1,740 second-feet 8 to 9 p.m. May 27 (gage height, 4.57 feet).

1906-7, 1911-12, 1915, 1918-19, 1925 to April 1948: Discharge observed, 1,240 second-feet May 21, 1912, June 3 or 4, 1933.

Remarks.- Small diversions above station for irrigation and some water diverted into Big Creek in Powder River Basin.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	277	940	255	11	360	762	131	21	1,080	443	90
2	255	1,070	222	12	352	658	121	22	1,170	585	84
3	264	1,100	202	13	412	582	121	23	1,160	357	81
4	280	1,040	185	14	474	551	114	24	1,280	345	81
5	277	1,040	178	15	500	536	110	25	1,400	328	75
6	356	1,050	163	16	630	495	103	26	1,450	303	74
7	492	984	157	17	794	457	100	27	1,500	291	77
8	452	978	147	18	772	407	103	28	1,390	282	91
9	412	943	135	19	1,070	397	98	29	1,030	276	81
10	372	870	128	20	1,090	389	97	30	863	267	74
								31	815		68
Monthly mean discharge, in second-feet									741	616	121
Runoff, in inches									8.14	6.54	1.33

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	3.41	826	3.54	784	3.67	989	3.86	1,130	3.80	1,080	3.84	1,110
8	3.56	796	3.27	744	3.80	1,080	3.78	1,070	3.78	1,070	3.94	1,190
N	3.52	772	3.22	716	3.74	1,040	3.71	1,020	3.70	1,010	3.97	1,220
4	3.51	766	3.24	727	3.80	1,080	3.73	1,030	3.73	1,020	3.90	1,160
8	3.54	784	3.57	802	3.93	1,180	3.87	1,140	3.87	1,140	3.91	1,170
12	3.57	802	3.55	910	3.93	1,180	3.87	1,140	3.89	1,150	3.90	1,160
	May 23		May 24		May 25		May 26		May 27		May 28	
4	3.87	1,140	3.99	1,230	4.17	1,380	4.20	1,410	4.28	1,480	4.51	1,560
8	3.81	1,090	3.91	1,170	4.09	1,310	4.11	1,330	4.17	1,380	4.17	1,450
N	3.74	1,040	3.84	1,110	4.01	1,250	4.04	1,270	4.07	1,300	4.08	1,370
4	3.81	1,090	3.95	1,200	4.11	1,330	4.17	1,380	4.25	1,460	3.97	1,290
8	4.11	1,330	4.25	1,460	4.45	1,640	4.56	1,730	4.57	1,740	3.91	1,250
12	4.10	1,320	4.31	1,510	4.40	1,500	4.47	1,650	4.44	1,660	3.80	1,170
	May 29		May 30		May 31		June 1		June 2		June 3	
4	3.71	1,110	3.40	920	3.21	806	3.34	884	3.59	1,030	3.77	1,150
8	3.63	1,060	3.31	866	3.15	772	3.26	836	3.53	998	3.68	1,090
N	3.55	1,010	3.23	818	3.11	750	3.25	830	3.48	968	3.59	1,030
4	3.47	962	3.21	806	3.12	756	3.46	956	3.61	1,050	3.63	1,060
8	3.49	974	3.30	860	3.36	896	3.72	1,110	3.87	1,220	3.74	1,130
12	3.49	974	3.27	842	3.46	956	3.68	1,090	3.86	1,210	3.70	1,100
	June 4		June 5		June 6		June 7		June 8		June 9	
4	3.62	1,050	3.61	1,050	3.58	1,030	3.52	992	3.48	968	3.42	932
8	3.55	1,010	3.53	998	3.52	992	3.46	956	3.45	950	3.56	896
N	3.48	968	3.45	950	3.42	932	3.39	914	3.41	926	3.29	854
4	3.54	1,000	3.57	1,020	3.56	1,020	3.49	974	3.49	974	3.41	926
8	3.72	1,110	3.75	1,120	3.75	1,120	3.59	1,030	3.62	1,050	3.63	1,060
12	3.71	1,110	3.67	1,080	3.64	1,060	3.55	1,010	3.52	992	3.52	992
	June 10		June 11		June 12		June 13		June 14		June 15	
4	3.39	914	3.24	824	2.96	670	2.81	595	2.75	568	2.73	558
8	3.30	860	3.17	784	2.91	645	2.76	572	2.69	540	2.68	536
N	3.22	812	3.08	723	2.85	615	2.72	554	2.65	522	2.62	509
4	3.25	818	3.08	723	2.82	600	2.74	563	2.67	532	2.61	504
8	3.34	884	3.09	754	2.90	640	2.82	600	2.76	572	2.72	554
12	3.52	872	3.02	701	2.86	620	2.80	590	2.72	554	2.72	554
	June 16		June 17		June 18		June 19		June 20		June 21	
4	2.64	518	2.49	456	2.35	402	2.36	406	2.30	385	2.44	436
8	2.58	492	2.46	444	2.32	392	2.32	392	2.27	374	2.62	509
N	2.54	475	2.42	428	2.30	385	2.31	388	2.27	374	2.50	460
4	2.53	472	2.39	416	2.32	392	2.30	385	2.33	396	2.43	432
8	2.56	484	2.43	432	2.47	448	2.34	399	2.35	402	2.58	413
12	2.54	476	2.39	416	2.43	432	2.33	396	2.36	406	2.37	410

Supplemental record.- May 19, 5 a.m., 3.79 ft., 1,070 sec.-ft.; May 27, 9 p.m., 4.57 ft., 1,740 sec.-ft.

Indian Creek near Imbler, Oreg.

Location.- Lat. 45°26', long. 117°49', in S½ sec. 33, T. 1 S., R. 40 E., 200 yards upstream from North Fork and 7 miles southeast of Imbler.

Drainage area.- 22 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 400 second-feet. Shifting-control method used May 22-28.

Maxima.- May-June 1948: Discharge, 818 second-feet 9 to p.m. May 27 (gage height, 3.52 feet).

1938 to April 1948: Discharge, 730 second-feet May 28, 1946; gage height, 3.92 feet (backwater from ice) sometime during period Dec. 7, 1941 to Apr. 19, 1942.

Remarks.- No diversion or regulation above station.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	46	360	119	11	59	336	50	21	275	229	24
2	43	432	105	12	59	289	45	22	364	205	22
3	43	438	92	13	87	255	40	23	382	178	21
4	42	390	83	14	90	238	37	24	400	165	20
5	39	395	80	15	97	230	35	25	444	155	18
6	50	398	73	16	130	213	32	26	537	144	18
7	72	412	70	17	187	194	30	27	665	136	17
8	72	451	63	18	218	185	30	28	637	134	19
9	66	466	57	19	303	190	28	29	460	132	20
10	61	415	52	20	299	183	26	30	359	130	18
								31	341		16
Monthly mean discharge, in second-feet									223	269	439
Runoff, in inches									11.71	13.66	2.30

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	2.42	179	2.47	202	2.66	309	2.65	302	2.63	290	2.67	302
8	2.43	184	2.47	202	2.64	296	2.64	296	2.60	270	2.79	363
N	2.43	184	2.48	206	2.63	290	2.63	290	2.59	264	2.83	391
4	2.45	192	2.50	215	2.65	302	2.64	296	2.59	264	2.84	391
8	2.46	197	2.54	237	2.67	316	2.65	302	2.60	270	2.85	398
12	2.47	202	2.64	296	2.67	316	2.64	296	2.62	283	2.85	391
	May 23		May 24		May 25		May 26		May 27		May 28	
4	2.85	391	2.86	377	2.98	428	3.09	512	3.24	592	3.40	757
8	2.83	377	2.86	377	2.95	405	3.06	488	3.28	624	3.30	693
N	2.80	349	2.83	356	2.95	405	3.05	480	3.25	600	3.15	592
4	2.86	391	2.92	420	3.06	488	3.17	576	3.34	672	3.05	563
8	2.88	398	2.97	458	3.01	450	3.20	600	3.49	792	2.98	535
12	2.86	384	2.98	442	3.12	556	3.23	600	3.47	792	3.00	570
	May 29		May 30		May 31		June 1		June 2		June 3	
4	2.95	535	2.70	370	2.64	340	2.66	350	2.78	418	2.84	458
8	2.86	472	2.67	355	2.62	350	2.62	330	2.77	412	2.82	444
N	2.80	430	2.65	345	2.60	320	2.61	325	2.76	406	2.81	437
4	2.79	424	2.66	350	2.65	345	2.67	355	2.82	444	2.80	430
8	2.78	418	2.69	365	2.67	355	2.76	406	2.87	479	2.79	424
12	2.73	388	2.67	355	2.67	355	2.76	406	2.85	465	2.76	406
	June 4		June 5		June 6		June 7		June 8		June 9	
4	2.75	400	2.73	388	2.75	400	2.78	418	2.78	418	2.86	472
8	2.74	394	2.71	376	2.70	370	2.75	400	2.77	412	2.81	437
N	2.71	376	2.69	365	2.70	370	2.70	370	2.75	400	2.77	412
4	2.72	382	2.76	406	2.75	400	2.75	400	2.80	430	2.83	451
8	2.73	388	2.80	430	2.79	424	2.82	444	2.93	521	2.93	521
12	2.74	394	2.78	418	2.79	424	2.83	451	2.90	500	2.90	500
	June 10		June 11		June 12		June 13		June 14		June 15	
4	2.84	458	2.66	350	2.56	302	2.46	259	2.41	239	2.40	235
8	2.79	424	2.65	355	2.54	293	2.43	247	2.39	232	2.37	226
N	2.74	394	2.61	325	2.51	280	2.42	243	2.37	226	2.36	223
4	2.74	394	2.61	325	2.50	275	2.45	255	2.39	232	2.39	232
8	2.73	388	2.64	340	2.53	288	2.47	265	2.44	251	2.39	232
12	2.69	365	2.60	320	2.49	271	2.44	251	2.42	243	2.36	223
	June 16		June 17		June 18		June 19		June 20		June 21	
4	2.34	217	2.28	199	2.25	184	2.26	193	2.23	184	2.29	202
8	2.32	211	2.27	196	2.21	178	2.25	190	2.21	178	2.39	232
N	2.31	208	2.24	187	2.20	175	2.24	187	2.20	175	2.45	255
4	2.33	214	2.25	190	2.21	178	2.24	187	2.21	178	2.42	243
8	2.33	214	2.27	196	2.29	202	2.25	190	2.25	190	2.39	232
12	2.30	205	2.24	187	2.29	202	2.24	187	2.27	196	2.36	223

Supplemental record.- May 27, 9 p.m., 3.52 ft., 818 sec.-ft., 10 p.m., 3.49 ft., 792 sec.-ft., 11 p.m., 3.52 ft., 818 sec.-ft.; June 1, 10 p.m., 2.80 ft., 430 sec.-ft.; June 8, 6 p.m. 3.00 ft., 570 sec.-ft.



## Hurricane Creek near Joseph, Oreg.

Location.- Lat. 45°20', long. 117°18', in NE $\frac{1}{4}$  sec. 3, T. 3 S., R. 44 E., upstream from intake of Moonshine ditch and 3 $\frac{1}{2}$  miles southeast of Joseph.

Drainage area.- 31 square miles.

Gage-height record.- Water-stage recorder graph except period 1 p.m. May 7 to 2 p.m.

May 11, when there was no gage-height record.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 455 second-foot and extended to peak stage by logarithmic plotting. Discharge for period of no gage-height record computed on basis of records for Bear Creek near Wallawa and Lostine River near Lostine.

Maxima.- May-June 1948: Discharge, 1,110 second-feet 11:30 p.m. June 9 (gage height, 3.55 feet).

1915, 1924 to April 1948: Discharge, 774 second-feet July 7, 1943 (gage height, 3.13 feet).

Remarks.- No diversion or regulation above station.

## Mean discharge, in second-feet, 1948

Monthly mean discharge, in second-feet, 1940											
Day	May	June	July	Day	May	June	July	Day	May	June	July
1	53	465	326	11	68	508	281	21	206	313	186
2	52	499	270	12	66	462	259	22	207	287	191
3	53	557	259	13	74	434	238	23	245	281	186
4	52	516	254	14	74	430	222	24	350	287	171
5	50	558	259	15	84	431	218	25	407	281	155
6	71	595	254	16	128	414	214	26	446	281	148
7	86	660	259	17	167	367	209	27	559	307	148
8	80	738	243	18	166	345	232	28	503	313	158
9	75	783	243	19	166	387	214	29	389	339	128
10	70	624	249	20	188	353	191	30	357	360	119
								31	420		119
Monthly mean discharge, in second-feet									191	439	212
Runoff, in inches									7.09	15.80	7.90

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	2.09	169	2.11	175	2.08	166	2.12	178	2.21	208	2.23	215
8	2.08	166	2.10	172	2.04	155	2.10	172	2.19	201	2.20	204
N	2.04	155	2.08	166	2.06	160	2.09	169	2.15	188	2.19	201
8	2.08	166	2.07	163	2.08	166	2.17	194	2.18	198	2.20	204
8	2.10	172	2.07	163	2.11	175	2.25	222	2.24	218	2.20	204
12	2.11	175	2.06	160	2.12	178	2.22	211	2.27	229	2.20	204
	May 23		May 24		May 25		May 26		May 27		May 28	
4	2.19	201	2.48	325	2.58	379	2.65	420	2.78	506	2.83	541
8	2.17	194	2.42	295	2.51	340	2.58	379	2.72	464	2.87	569
N	2.19	201	2.45	310	2.56	368	2.58	379	2.77	499	2.77	499
8	2.38	276	2.58	379	2.71	457	2.77	499	3.00	670	2.70	450
8	2.49	330	2.65	420	2.75	485	2.81	527	3.00	670	2.72	464
12	2.50	335	2.62	402	2.65	420	2.80	520	2.87	569	2.66	426
	May 29		May 30		May 31		June 1		June 2		June 3	
4	2.61	396	2.54	357	2.61	396	2.73	471	2.65	420	2.95	630
8	2.60	390	2.48	325	2.60	390	2.68	438	2.63	408	2.90	590
N	2.59	384	2.47	320	2.58	379	2.66	426	2.64	414	2.82	534
8	2.60	390	2.54	357	2.67	432	2.75	485	2.86	562	2.77	499
8	2.58	379	2.61	396	2.75	485	2.77	499	2.99	662	2.81	527
12	2.56	368	2.63	408	2.73	471	2.73	471	2.90	590	2.82	534
	June 4		June 5		June 6		June 7		June 8		June 9	
4	2.85	555	2.80	520	2.89	583	2.96	638	3.02	686	3.04	702
8	2.75	485	2.73	471	2.81	527	2.97	646	3.01	678	2.97	646
N	2.70	450	2.78	506	2.82	534	2.85	555	3.00	670	2.98	654
8	2.76	492	2.98	654	2.90	590	3.00	670	3.16	798	3.16	798
8	2.88	576	3.00	670	3.07	726	3.10	750	3.22	846	3.31	918
12	2.83	541	2.91	598	3.08	734	3.00	670	3.20	830	3.49	1,060
	June 10		June 11		June 12		June 13		June 14		June 15	
4	3.23	620	3.13	527	3.07	476	3.00	420	3.02	436	3.01	428
8	3.22	610	3.11	509	3.04	452	2.97	398	2.98	405	2.97	398
N	3.12	518	3.09	492	3.02	436	2.97	398	2.96	390	2.95	382
8	3.14	536	3.08	484	3.03	444	3.04	452	3.03	444	3.03	444
8	3.20	590	3.10	500	3.05	460	3.07	476	3.05	460	3.09	492
12	3.18	572	3.10	500	3.05	460	3.05	460	3.02	436	3.04	452
	June 16		June 17		June 18		June 19		June 20		June 21	
4	3.02	436	2.95	382	2.91	352	2.92	360	2.94	375	2.87	326
8	2.97	398	2.93	368	2.90	345	2.92	360	2.91	352	2.86	319
N	2.96	390	2.91	352	2.88	332	2.95	382	2.90	345	2.85	313
8	2.99	412	2.91	352	2.87	326	2.99	412	2.89	339	2.84	307
8	3.00	420	2.93	368	2.91	352	3.00	420	2.89	339	2.83	300
12	2.98	405	2.92	360	2.93	368	2.98	405	2.88	332	2.82	294

Supplemental record.- May 18, 6 a.m., 2.05 ft., 158 sec.-ft.; May 19, 2 a.m., 2.09 ft., 189 sec.-ft.; June 5, 10 p.m., 2.84 ft., 548 sec.-ft.; June 6, 10 p.m., 2.93 ft., 614 sec.-ft.; June 9, 11:30 p.m., 3.55 ft., 1,110 sec.-ft.; June 10, 9 a.m., 3.30 ft., 690 sec.-ft.; June 12, 1 a.m., 3.15 ft., 545 sec.-ft.



## Lostine River near Lostine, Oreg.

Location.- Lat. 45°26', long. 117°26', in NW $\frac{1}{4}$  sec. 34, T. 1 S., R. 43 E., 3 $\frac{1}{2}$  miles south of Lostine and 10 miles upstream from mouth.

Drainage area.- 70 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 1,350 second-feet and extended to peak stage.

Maxima.- May-June 1948: Discharge, 1,960 second-feet 11:30 p.m. June 9 (gage height, 7.27 feet).

1912-14, 1915, 1925 to April 1948: Discharge, 2,540 second-feet May 27, 1913.

Remarks.- Flow slightly regulated by Minam Lake Reservoir.

## Mean discharge, in second-feet, 1948

mean discharge, in second-feet, 1940											
Day	May	June	July	Day	May	June	July	Day	May	June	July
1	185	1,170	1,110	11	210	1,560	575	21	711	1,070	304
2	169	1,400	900	12	210	1,330	539	22	749	886	302
3	171	1,500	738	13	264	1,250	476	23	766	819	302
4	174	1,310	676	14	277	1,260	431	24	962	889	277
5	161	1,330	672	15	283	1,300	408	25	1,180	924	238
6	218	1,540	599	16	395	1,260	390	26	1,330	917	218
7	317	1,650	602	17	569	1,080	365	27	1,560	962	220
8	275	1,740	536	18	560	1,010	405	28	1,640	1,050	209
9	246	1,750	506	19	609	1,120	390	29	1,240	1,120	190
10	226	1,700	524	20	635	1,120	340	30	1,040	1,190	171
								31	1,050		166
Monthly mean discharge, in second-feet .....									593	1,240	444
Runoff, in inches .....									9.77	19.77	7.32

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	3.79	592	3.75	580	3.87	616	3.91	628	4.25	730	4.42	787
8	3.75	580	3.72	571	3.84	607	3.85	610	4.16	703	4.37	770
N	3.68	559	3.65	550	3.79	592	3.78	589	4.08	679	4.28	739
4	3.64	547	3.62	541	3.83	604	3.85	610	4.05	670	4.22	721
8	3.67	556	3.65	550	3.93	634	4.11	688	4.24	727	4.23	724
12	3.73	574	3.71	568	3.94	637	4.27	736	4.39	776	4.25	730
	May 23		May 24		May 25		May 26		May 27		May 28	
4	4.21	718	4.82	928	5.40	1,160	5.84	1,340	6.34	1,540	7.00	1,840
8	4.15	700	4.68	878	5.25	1,100	5.61	1,240	6.16	1,460	6.80	1,740
N	4.11	688	4.60	850	5.16	1,060	5.49	1,200	5.99	1,400	6.56	1,640
4	4.30	745	4.81	924	5.37	1,150	5.65	1,260	6.23	1,490	6.32	1,530
8	4.74	899	5.28	1,110	5.82	1,330	6.16	1,460	6.85	1,770	6.15	1,450
12	4.91	964	5.51	1,200	5.96	1,380	6.41	1,570	7.06	1,860	6.01	1,400
	May 29		May 30		May 31		June 1		June 2		June 3	
4	5.89	1,360	5.24	1,100	5.21	1,080	5.47	1,190	6.02	1,410	6.63	1,670
8	5.74	1,300	5.08	1,030	5.07	1,030	5.31	1,120	5.85	1,340	6.40	1,560
N	5.56	1,220	4.94	976	4.92	968	5.15	1,060	5.66	1,260	6.15	1,460
4	5.37	1,150	4.93	972	4.90	960	5.23	1,090	5.71	1,280	5.97	1,390
8	5.31	1,120	5.16	1,060	5.26	1,100	5.75	1,300	6.34	1,540	5.92	1,370
12	5.34	1,140	5.29	1,120	5.52	1,210	6.10	1,440	6.70	1,700	6.00	1,400
	June 4		June 5		June 6		June 7		June 8		June 9	
4	6.00	1,400	5.76	1,300	6.49	1,610	6.76	1,730	6.84	1,760	6.95	1,810
8	5.89	1,360	5.64	1,260	6.23	1,490	6.50	1,610	6.68	1,690	6.67	1,690
N	5.71	1,280	5.49	1,200	5.97	1,390	6.25	1,500	6.53	1,620	6.41	1,570
4	5.60	1,240	5.61	1,240	6.00	1,400	6.34	1,540	6.57	1,640	6.52	1,620
8	5.63	1,250	6.27	1,510	6.60	1,660	6.78	1,740	7.02	1,840	7.06	1,860
12	5.75	1,300	6.62	1,660	6.95	1,810	6.95	1,810	7.16	1,910	7.26	1,950
	June 10		June 11		June 12		June 13		June 14		June 15	
4	7.02	1,850	6.63	1,690	6.05	1,460	5.65	1,300	5.78	1,350	5.81	1,360
8	6.72	1,730	6.44	1,620	5.80	1,360	5.46	1,220	5.54	1,260	5.63	1,290
N	6.39	1,600	6.18	1,510	5.55	1,260	5.29	1,160	5.31	1,130	5.43	1,210
4	6.24	1,540	597	1,430	539	1,200	5.28	1,150	5.26	1,140	5.42	1,210
8	6.49	1,640	6.10	1,480	5.56	1,260	5.63	1,290	5.64	1,300	5.78	1,350
12	6.66	1,700	6.18	1,510	5.75	1,340	5.88	1,390	5.82	1,370	6.00	1,440
	June 16		June 17		June 18		June 19		June 20		June 21	
4	5.92	1,410	5.29	1,160	5.05	1,070	5.10	1,080	5.43	1,210	5.12	1,090
8	5.68	1,310	5.10	1,080	4.88	1,010	5.04	1,060	5.22	1,130	5.17	1,110
N	5.43	1,210	4.91	1,020	4.72	952	5.07	1,070	5.07	1,070	5.15	1,100
4	5.26	1,140	4.83	990	4.67	934	5.18	1,110	5.00	1,050	5.00	1,050
8	5.34	1,180	5.04	1,060	4.87	1,000	5.43	1,210	5.06	1,070	4.90	1,020
12	5.44	1,220	5.15	1,100	5.10	1,080	5.59	1,280	5.13	1,100	4.81	984

Supplemental record.- June 6, 2 p.m., 5.90 feet, 1,360 sec.-ft.; June 7, 2 p.m., 6.22 ft., 1,490 sec.-ft.; June 9, 1 p.m., 6.37 ft., 1,550 sec.-ft., 11:30 p.m. 7.27 ft., 1,960 sec.-ft.; June 12, 6 p.m., 5.43 ft., 1,210 sec.-ft.; June 15, 2 p.m., 5.38 ft., 1,190 sec.-ft.

## Bear Creek near Wallowa, Oreg.

Location.- Lat. 45°32', long. 117°33', in NE $\frac{1}{4}$  sec. 34, T. 1 N., R. 42 E., at bridge  $\frac{1}{2}$  miles southwest of Wallowa.

Drainage area.- 68 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge, 1,180 second-feet 4 a.m. June 11 (gage height, 3.29 feet).

1915, 1924 to April 1948: Discharge, 1,620 second-feet Apr. 22, 1936 (gage height, 3.82 feet, from floodmarks), from rating curve extended above 950 second-feet.

Remarks.- Small diversions above station for irrigation.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	202	554	512	11	280	1,110	214	21	596	794	84
2	194	729	412	12	270	923	180	22	611	653	71
3	198	980	356	13	345	898	153	23	634	597	66
4	226	964	335	14	370	853	136	24	673	590	59
5	226	917	325	15	370	844	119	25	772	590	53
6	270	1,020	280	16	437	770	105	26	926	597	50
7	381	1,040	270	17	519	567	97	27	977	558	51
8	365	1,020	232	18	491	642	111	28	765	564	61
9	325	1,010	209	19	539	676	105	29	659	570	56
10	298	1,040	200	20	631	656	97	30	582	584	52
								31	536		46
Monthly mean discharge, in second-feet.....									473	777	164
Runoff, in inches.....									8.02	12.75	2.79

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	2.36	521	2.31	491	2.37	527	2.53	630	2.49	604	2.50	610
N	2.34	509	2.29	479	2.40	545	2.56	649	2.43	564	2.50	610
8	2.35	515	2.31	491	2.48	597	2.53	630	2.50	610	2.51	616
	May 23		May 24		May 25		May 26		May 27		May 28	
4	2.52	623	2.58	662	2.72	759	2.94	915	2.98	945	3.05	998
N	2.52	623	2.56	649	2.67	724	2.93	908	3.00	960	2.82	829
8	2.49	604	2.55	642	2.67	724	2.94	915	2.97	938	2.65	708
12	2.51	616	2.58	662	2.70	745	3.04	990	2.96	930	2.48	597
4	2.62	689	2.65	710	2.85	850	2.97	958	3.17	1,090	2.45	578
8	2.62	689	2.69	738	2.94	915	2.88	871	3.23	1,130	2.53	630
	May 29		May 30		May 31		June 1		June 2		June 3	
4	2.72	759	2.44	571	2.39	539	2.40	545	2.65	710	3.17	1,090
N	2.64	703					2.44	57.1	2.64	703	3.08	1,020
8	2.56	649					2.44	571	2.58	662	3.00	960
12	2.52	623	2.47	590	2.34	509	2.39	539	2.60	675	2.93	908
4	2.50	610					2.40	545	2.81	822	2.92	900
8	2.47	590	2.45	578	2.39	539	2.44	571	3.09	1,030	3.01	968
	June 4		June 5		June 6		June 7		June 8		June 9	
4	3.07	1,010	2.87	864	3.15	1,070	3.14	1,060	3.02	975	3.10	1,040
N	3.05	998	2.83	836	3.06	1,000	3.07	1,010	3.00	960	3.02	975
8	3.01	968	2.80	815	3.00	960	3.03	982	3.09	1,030	3.00	960
12	2.98	945	2.95	922	3.00	960	3.09	1,030	3.13	1,060	3.02	975
4	2.96	930	3.12	1,050	3.08	1,020	3.16	1,080	3.15	1,070	3.10	1,040
8	2.92	900	3.23	1,130	3.20	1,110	3.10	1,040	3.13	1,060	3.17	1,090
	June 10		June 11		June 12		June 13		June 14		June 15	
4	3.15	1,070	3.29	1,180	2.98	935	2.95	912	2.93	898	2.79	793
N	3.11	1,040	3.25	1,150	2.91	882	2.87	852	2.86	845	2.81	808
8	3.08	1,020	3.21	1,120	2.91	882	2.85	838	2.80	800	2.86	845
12	3.07	1,010	3.20	1,110	2.92	890	2.91	882	2.88	860	2.89	868
4	3.09	1,030	3.15	1,070	3.03	974	3.02	966	2.87	852	2.95	912
8	3.19	1,100	3.08	1,010	2.99	942	2.97	928	2.80	800	2.90	875
	June 16		June 17		June 18		June 19		June 20		June 21	
4	2.86	845	2.55	625	2.54	618	2.60	660	2.60	660	2.80	800
N	2.85	838	2.42	538	2.55	625	2.52	604	2.55	625	2.87	852
8	2.76	772	2.38	512	2.57	639	2.54	618	2.52	604	2.84	830
12	2.61	667	2.40	525	2.55	625	2.56	632	2.53	611	2.77	779
4	2.67	709	2.47	570	2.65	695	2.79	793	2.63	681	2.74	758
8	2.65	695	2.47	570	2.71	737	2.74	758	2.73	751	2.72	744

## Asotin Creek Basin

Asotin Creek near Asotin, Wash.

Location.- Lat. 46°20', long. 117°12', in sec. 20, T. 10 N., R. 45 E., half a mile upstream from Washington Water Power Co.'s diversion for water supply and irrigation, 4 miles upstream from George Creek, and 8 miles west of Asotin.

Drainage area.- 171 square miles.

Gage-height record.- Staff gage read twice daily.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Shifting-control method used May 1 to July 31. Gage height used to hundredths May 17 to June 21; half tenths above and hundredths below 1.0 feet May 1-16, June 22 to July 31.

Maxima.- May-June 1948: Discharge observed, 511 second-feet 8 a.m. May 28 (gage height, 2.80 feet).

1904-6, 1910-11, 1928 to April 1948: Discharge observed, 1,180 second-feet Apr. 15, 1904 (gage height, 4.3 feet, datum then in use).

Remarks.- Diversions above station for irrigation. No regulation. Gage-height record furnished by Washington Water Power Co.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	149	362	70	11	210	262	56	21	378	120	50
2	138	377	67	12	238	210	55	22	391	118	47
3	128	398	63	13	300	205	52	23	380	100	46
4	138	370	60	14	333	172	51	24	374	97	45
5	138	333	65	15	300	193	50	25	398	90	44
6	149	326	61	16	284	202	48	26	436	86	44
7	197	320	63	17	323	165	47	27	489	81	44
8	184	320	60	18	300	149	47	28	493	77	50
9	184	304	57	19	313	134	50	29	450	74	48
10	197	296	55	20	360	130	54	30	398	74	46
								31	384		43
Monthly mean discharge, in second-feet									295	205	528
Runoff, in inches									1.99	1.34	0.36

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
May 17			May 26			June 4			June 13		
8	2.28	330	8	2.58	432	8	2.54	384	8	2.12	197
5	2.24	316	5	2.60	440	5	2.46	357	5	2.18	213
May 18			May 27			June 5			June 14		
8	2.20	303	8	2.78	503	8	2.42	336	8	2.08	182
5	2.18	297	5	2.70	475	5	2.40	330	5	2.00	162
May 19			May 28			June 6			June 15		
8	2.20	303	8	2.80	511	8	2.42	330	8	2.10	182
5	2.28	323	5	2.70	475	5	2.40	323	9	2.16	197
May 20			May 29			June 7			10	2.14	192
8	2.38	364	8	2.64	450	8	2.44	330	5	2.18	202
5	2.36	357	5	2.64	450	5	2.38	310	June 16		
May 21			May 30			June 8			8	2.16	197
8	2.35	353	8	2.54	412	8	2.46	330	5	2.20	207
5	2.50	404	5	2.46	384	5	2.40	310	June 17		
May 22			May 31			June 9			8	2.08	172
8	2.38	364	8	2.50	394	8	2.42	310	5	2.00	158
5	2.54	418	5	2.44	374	5	2.38	297	June 18		
May 23			June 1			June 10			8	1.98	153
8	2.44	384	8	2.45	374	8	2.43	307	5	1.94	145
5	2.42	377	5	2.38	350	5	2.36	284	June 19		
May 24			June 2			June 11			8	1.90	136
8	2.48	398	8	2.50	384	8	2.32	265	5	1.88	132
5	2.34	350	5	2.46	370	5	2.30	259	June 20		
May 25			June 3			June 12			8	1.84	124
8	2.50	404	8	2.58	404	8	2.18	218	5	1.90	136
5	2.46	391	5	2.54	391	5	2.12	202	June 21		
									8	1.84	124
									5	1.80	116

## Clearwater River Basin

Selway River above Meadow Creek, near Lowell, Idaho

Location.- Lat. 46°03', long. 115°18', in sec. 11, T. 31 N., R. 9 E., a quarter of a mile upstream from Meadow Creek, 1½ miles upstream from Selway Falls, 13 miles upstream from gaging station on Selway River near Lowell, and 16.5 miles southeast of Lowell post office.

Drainage area.- 1,550 square miles.

Gage-height record.- Water-stage recorder graph except period 11 p.m. May 19 to 1:10 p.m. July 12, when there was no gage-height record. Staff gage read June 3, 10, 25.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 22,800 second-feet and extended to peak stage on basis of slope-area measurement.

Discharge for periods of no gage-height record computed on basis of records for station near Lowell. Shifting-control method used June 25, July 12-31.

Maxima.- May-June 1948: Discharge, 42,000 second-feet May 29 (gage height, 22.4 feet, from floodmark), by slope-area method.

1944 to April 1948: Discharge, 33,200 second-feet May 8, 1947 (gage height, 18.85 feet, from floodmark).

Remarks.- Small diversions to Bitterroot River Basin from headwaters are reported and are shown on maps in T. 32 N., R. 16 E.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	6,570	26,000	5,000	11	7,020	18,000	2,500	21	23,700	9,400	2,230
2	5,830	27,500	4,800	12	7,210	15,500	2,490	22	26,000	9,600	1,940
3	5,530	28,600	4,300	13	8,240	15,000	2,340	23	22,000	8,000	1,770
4	5,800	25,000	3,900	14	8,600	13,000	2,200	24	21,500	7,400	1,650
5	5,340	21,000	3,650	15	8,260	12,000	2,080	25	25,000	7,200	1,560
6	5,980	21,500	3,400	16	9,510	11,500	1,960	26	27,000	6,600	1,460
7	8,440	22,000	3,200	17	12,800	10,000	1,880	27	30,000	6,000	1,420
8	8,790	22,000	3,000	18	17,100	9,000	1,870	28	32,500	5,600	1,720
9	7,780	20,500	2,800	19	18,100	9,500	1,980	29	36,500	5,400	2,420
10	7,110	18,600	2,650	20	23,500	8,200	2,280	30	30,000	5,200	2,240
								31	27,500		1,930
Monthly mean discharge, in second-feet .....									15,780	14,130	2,536
Runoff, in inches .....									11.74	10.17	1.89

## Selway River near Lowell, Idaho

Location.- Lat. 46°05', long. 115°31', in sec. 25, T. 32 N., R. 7 E., a quarter of a mile upstream from O'Hara Creek and 7 miles upstream from Lowell post office.

Drainage area.- 1,910 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 31,600 second-feet and extended to peak stage. Shifting-control method used May 1 to July 31.

Maxima.- May-June 1948: Discharge, 48,900 second-feet 4 a.m. May 29 (gage height, 16.04 feet).

1929 to April 1948: Discharge, 37,000 second-feet May 8, 1947 (gage height, 13.71 feet).

Remarks.- No regulation or diversion above station.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	8,470	31,000	6,370	11	9,190	23,200	3,220	21	29,000	12,000	2,870
2	7,670	32,200	6,120	12	9,420	19,800	3,180	22	31,400	12,300	2,420
3	7,250	33,600	5,390	13	10,700	19,100	2,940	23	27,400	10,300	2,190
4	7,640	29,900	4,980	14	11,200	16,800	2,740	24	26,800	9,550	2,050
5	7,030	26,200	4,670	15	10,800	15,000	2,600	25	30,500	9,100	1,930
6	7,910	27,000	4,350	16	12,000	14,500	2,480	26	34,100	8,380	1,840
7	10,900	28,200	4,060	17	15,700	13,000	2,360	27	37,100	7,670	1,810
8	11,200	28,000	3,790	18	20,400	11,300	2,380	28	41,400	7,190	2,430
9	10,200	26,000	3,540	19	21,500	10,800	2,550	29	45,300	6,900	3,450
10	9,520	24,100	3,360	20	28,400	10,400	3,040	30	35,900	6,580	2,940
								31	31,500		2,480
Monthly mean discharge, in second-feet .....									19,570	17,670	3,242
Runoff, in inches .....									11.81	10.32	1.96

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	9.27	14,500	10.85	21,100	10.75	20,600	12.64	29,500	12.63	29,400	13.40	33,200
8	9.37	14,900	10.82	20,900	10.69	20,400	12.54	29,000	12.41	28,400	13.26	32,600
N	9.37	14,900	10.73	20,500	10.60	20,000	12.25	27,600	12.16	27,200	13.02	31,400
4	9.52	15,600	10.62	20,000	10.70	20,400	12.20	27,400	12.20	27,400	12.76	30,100
8	9.98	17,500	10.59	19,900	11.27	23,000	12.44	28,500	12.77	30,100	12.67	29,600
12	10.56	20,000	10.67	20,300	12.18	27,300	12.69	29,700	13.37	33,100	12.68	29,700
	May 23		May 24		May 25		May 26		May 27		May 28	
4	12.59	29,200	12.10	26,900	12.85	30,500	13.75	35,000	14.48	38,400	14.80	42,200
8	12.34	28,000	11.85	25,700	12.60	29,300	13.43	33,400	14.04	36,100	14.64	41,300
N	12.06	26,700	11.63	24,700	12.35	28,100	13.09	31,700	13.68	34,200	14.31	39,600
4	11.88	25,800	11.75	25,200	12.53	28,900	13.20	32,200	13.81	34,800	14.14	38,700
8	12.01	26,400	12.33	28,000	13.19	32,200	13.32	35,400	14.60	38,800	14.81	42,200
12	12.22	27,400	12.86	30,600	13.77	35,200	14.40	38,500	15.26	42,000	15.57	46,400
	May 29		May 30		May 31		June 1		June 2		June 3	
4	16.04	48,900	14.21	39,000	13.05	33,000	12.89	32,200	13.09	33,200	13.46	35,100
8	15.84	47,800	13.78	36,800	12.73	31,400	12.60	30,800	12.83	31,900	13.30	34,300
N	15.47	45,800	13.38	34,700	12.45	30,000	12.31	29,500	12.54	30,500	13.10	33,200
4	15.07	43,600	13.14	33,400	12.36	29,600	12.29	29,200	12.57	30,600	12.95	32,400
8	14.79	42,200	13.26	34,100	12.72	31,400	12.76	31,600	13.05	33,000	12.99	32,700
12	14.60	41,100	13.28	34,200	12.96	32,600	13.13	33,400	13.48	35,200	13.08	33,200
	June 4		June 5		June 6		June 7		June 8		June 9	
4	12.95	32,500	11.82	27,200	11.90	27,600	12.19	29,000	12.37	29,900	11.87	27,400
8	12.64	31,000	11.60	26,200	11.65	26,400	11.84	27,300	11.95	27,800	11.52	25,800
N	12.33	29,400	11.38	25,100	11.38	25,100	11.58	26,100	11.61	26,200	11.21	24,300
4	12.08	28,200	11.33	24,900	11.50	25,700	11.74	26,800	11.63	26,500	11.20	24,300
8	11.98	27,700	11.60	26,200	12.04	28,300	12.32	29,600	12.02	28,200	11.60	26,200
12	11.95	27,600	11.91	27,600	12.37	29,900	12.62	31,100	12.13	28,700	11.84	27,300
	June 10		June 11		June 12		June 13		June 14		June 15	
4	11.60	26,200	11.23	24,400	10.67	21,800	10.04	19,000	9.86	18,300	9.31	15,900
8	11.18	24,200	10.95	23,100	10.32	20,300	10.13	19,400	9.66	17,400	9.16	15,300
N	10.83	22,600	10.78	22,300	10.04	19,300	10.21	19,800	9.44	16,500	9.02	14,700
4	10.73	22,100	10.79	22,400	9.86	18,300	10.05	19,100	9.26	15,700	8.94	14,400
8	11.00	23,400	10.93	23,000	9.89	18,400	9.97	18,700	9.29	15,800	8.92	14,300
12	11.25	24,500	10.96	23,200	9.99	18,800	9.94	18,600	9.36	16,100	9.05	14,900
	June 16		June 17		June 18		June 19		June 20		June 21	
4	9.19	15,400	8.84	14,000	8.32	12,000	8.08	11,100	7.84	10,300	8.07	11,100
8	9.11	15,100	8.72	13,500	8.22	11,600	8.06	11,100	7.87	10,700	8.16	11,400
N	8.95	14,500	8.57	13,000	8.11	11,200	8.00	10,800	7.88	10,400	8.29	11,900
4	8.84	14,000	8.42	12,400	8.01	10,900	7.92	10,600	7.82	10,200	8.45	12,400
8	8.84	14,000	8.36	12,200	7.99	10,800	7.87	10,400	7.85	10,300	8.63	13,200
12	8.87	14,100	8.34	12,100	8.04	11,000	7.86	10,400	7.94	10,600	8.76	13,700

Supplemental record.- May 19, 2 p.m., 10.59 ft., 19,900 sec.-ft.; May 21, 2 p.m., 12.11 ft., 26,900 sec.-ft.; May 26, 2 a.m., 13.83 ft., 35,500 sec.-ft., 2 p.m., 13.07 ft., 31,600 sec.-ft.; May 27, 2 a.m., 14.50 ft., 39,000 sec.-ft., 2 p.m., 13.67 ft., 34,100 sec.-ft.; May 28, 1 a.m., 15.01 ft., 42,000 sec.-ft., 2 a.m., 14.79 ft., 42,200 sec.-ft.; June 1, 2 p.m., 12.25 ft., 29,000 sec.-ft.; June 2, 2 a.m., 13.15 ft., 33,500 sec.-ft., 2 p.m., 12.49 ft., 30,200 sec.-ft.; June 5, 2 p.m., 11.31 ft., 24,800 sec.-ft.; June 6, 2 a.m., 11.95 ft., 27,800 sec.-ft., 2 p.m., 11.55 ft., 25,000 sec.-ft.; June 8, 2 p.m., 11.57 ft., 26,000 sec.-ft., 10 p.m., 12.14 ft., 28,700 sec.-ft.; June 9, 2 p.m., 11.15 ft., 24,000 sec.-ft.; June 11, 2 a.m., 11.30 ft., 24,700 sec.-ft.

## Clearwater River at Kamiah, Idaho

Location.— Lat. 46°14', long. 116°01', in sec. 1, T. 33 N., R. 3 E., a quarter of a mile downstream from highway bridge at Kamiah, three-quarters of a mile downstream from Lawyer Creek, and 6 miles downstream from South Fork. (See pl. 12A.)

Drainage area.— 4,860 square miles.

Gage-height record.— Water-stage recorder graph.

Discharge record.— Stage-discharge relation defined by current-meter measurements.

Shifting-control method used May 30 to July 31.

Maxima.— May-June 1948: Discharge, 99,000 second-feet 8 a.m. May 29 (gage height, 19.22 feet).

1910 to April 1948: Discharge observed, 81,400 second-feet June 10, 1933 (gage height, 16.53 feet, former site).

Remarks.— Gage-height record collected in cooperation with U. S. Weather Bureau.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	21,500	64,200	13,800	11	26,700	46,800	6,840	21	61,100	24,900	6,140
2	19,000	65,400	13,100	12	25,300	42,500	6,710	22	77,800	28,100	5,170
3	17,500	68,800	11,700	13	29,500	38,800	6,250	23	66,800	24,000	4,620
4	18,900	62,700	10,900	14	31,900	36,100	5,820	24	61,800	21,900	4,320
5	17,700	54,500	10,200	15	29,000	31,600	5,520	25	65,600	20,600	4,060
6	18,500	52,900	9,520	16	30,700	30,500	5,250	26	72,200	19,000	3,850
7	26,700	55,600	8,740	17	36,900	28,300	5,040	27	77,700	17,300	3,790
8	31,200	55,900	8,280	18	47,400	24,400	4,970	28	86,800	16,000	5,010
9	30,800	52,200	7,740	19	47,800	23,400	5,590	29	94,000	15,200	8,150
10	26,700	49,800	7,240	20	59,500	21,800	6,140	30	77,300	14,200	6,540
								31	67,400		5,370
Monthly mean discharge, in second-feet .....									45,220	36,910	6,973
Runoff, in inches .....									10.75	8.49	1.66

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	11.74	34,500	13.24	45,900	13.39	47,100	14.89	59,800	15.24	62,900	15.99	69,600
8	11.99	36,300	13.56	48,500	13.42	47,400	15.09	61,500	15.20	62,500	16.58	75,000
N	12.13	37,400	13.65	49,300	13.38	47,100	15.02	60,900	15.02	60,900	17.84	84,700
4	12.17	37,600	13.58	48,700	13.34	46,700	14.78	58,800	14.78	58,800	17.78	85,900
8	12.27	38,400	13.46	47,700	13.51	48,100	14.79	58,900	14.80	59,000	17.38	82,200
12	12.74	42,000	13.39	47,100	14.12	53,200	15.04	61,100	15.36	63,900	16.48	74,100
	May 23		May 24		May 25		May 26		May 27		May 28	
4	16.10	70,600	15.32	63,600	15.69	66,900	16.52	74,500	17.14	80,100	18.08	88,600
8	15.94	69,200	15.22	62,700	15.73	67,300	16.56	74,800	17.13	80,000	18.18	89,500
N	15.60	66,100	15.13	61,900	15.51	65,300	16.24	71,900	16.78	76,800	17.49	87,800
4	15.31	63,500	14.87	59,600	15.31	63,500	15.42	69,000	16.46	73,900	17.64	84,700
8	15.21	62,600	14.93	60,100	15.39	64,200	16.06	70,200	16.72	76,300	17.58	84,100
12	15.25	63,000	15.27	63,100	16.04	70,100	16.66	75,700	17.38	82,200	18.21	89,800
	May 29		May 30		May 31		June 1		June 2		June 3	
4	18.95	96,600	17.65	84,300	16.35	72,000	15.85	67,000	16.03	68,600	16.21	70,700
8	19.22	99,000	17.27	80,800	16.10	69,700	15.76	66,200	15.93	67,700	16.23	70,900
N	18.99	96,900	16.76	76,200	15.75	66,600	15.48	63,700	15.63	65,000	16.10	69,700
4	18.54	92,900	16.28	71,800	15.43	63,700	15.19	61,100	15.33	62,300	15.93	68,200
8	18.22	89,900	16.16	70,700	15.40	63,400	15.22	61,400	15.38	62,800	15.76	66,600
12	17.94	87,400	16.36	72,500	15.65	65,600	15.68	65,500	15.83	66,800	15.73	66,400
	June 4		June 5		June 6		June 7		June 8		June 9	
4	15.74	66,000	14.78	57,100	14.54	55,100	14.86	58,200	15.03	59,700	14.62	55,700
8	15.65	65,200	14.67	56,200	14.51	54,800	14.89	58,500	15.01	59,500	14.56	55,200
N	15.37	62,700	14.47	54,500	14.28	52,900	14.62	56,200	14.64	56,300	14.20	52,200
4	15.13	60,600	14.22	52,300	14.02	50,700	14.23	52,900	14.24	52,900	13.84	49,200
8	14.98	59,300	14.10	51,400	14.01	50,600	14.21	52,700	14.13	52,000	13.76	48,500
12	14.86	58,200	14.27	52,800	14.39	53,800	14.63	56,300	14.37	54,000	14.03	50,800
	June 10		June 11		June 12		June 13		June 14		June 15	
4	14.39	53,800	13.70	48,000	13.59	46,700			12.67	39,500		
8	14.35	53,400	13.78	48,700	13.41	45,300	12.49	38,200	12.43	37,700	11.72	32,300
N	13.96	50,200	13.63	47,500	13.08	42,700						
4	13.56	46,900	13.36	45,300	12.76	40,200	12.66	39,400	11.96	34,300	11.56	31,200
8	13.39	45,500	13.32	45,000	12.49	38,200			11.74	32,800	11.42	30,300
12	13.55	46,800	13.42	45,800	12.44	37,800	12.69	39,700	11.69	32,400	11.48	30,700
	June 16		June 17		June 18		June 19		June 20		June 21	
4	11.60	31,500	11.31	29,600	10.60	24,900					10.17	22,400
N			11.18	28,800	10.55	24,600	10.39	23,700	10.02	21,600	10.48	24,200
4	11.35	29,900	11.07	28,100							10.82	26,200
8			10.81	26,500	10.29	23,100			10.01	21,500		
12	11.27	29,400	10.69	25,700	10.37	23,600	10.17	22,400	10.07	21,900	11.02	27,500

Supplemental record.— May 22, 2 p.m., 17.84 ft., 86,500 sec.-ft.; May 27, 6 a.m., 17.19 ft., 80,500 sec.-ft.

## Clearwater River at Spalding, Idaho

Location.- Lat. 46°25', long. 116°51', in lot 22, sec. 22, T. 36 N., R. 4 W., a quarter of a mile downstream from Lapwai Creek and three-eighths of a mile northwest of Spalding post office.

Drainage area.- 9,570 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements to 100,000 second-feet; extended to crest stage.

Maxima.- May-June 1948: Discharge, 177,000 second-feet 3 p.m. May 29 (gage height, 23.76 feet).

1926 to April 1948: Discharge, 172,000 second-feet Dec. 23, 1933, from rating curve extended above 100,000 second-feet by logarithmic plotting.

Remarks.- Negligible amount of diversion above station.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	42,600	118,000	22,300	11	57,600	81,000	12,000	21	113,000	40,400	11,700
2	37,700	116,000	21,200	12	54,200	76,400	11,600	22	142,000	46,400	9,890
3	34,500	119,000	19,600	13	58,900	65,200	11,100	23	142,000	41,100	8,720
4	37,400	115,000	18,000	14	64,800	64,200	10,300	24	124,000	36,300	8,090
5	37,000	99,900	16,800	15	57,600	54,900	9,820	25	124,000	33,800	7,620
6	36,700	92,700	15,800	16	56,500	55,200	9,440	26	131,000	31,700	7,290
7	50,000	93,600	14,800	17	64,700	50,300	9,020	27	138,000	29,600	7,080
8	65,300	94,100	14,200	18	80,300	43,900	8,650	28	150,000	27,100	9,440
9	73,700	89,100	13,400	19	82,800	41,500	9,050	29	166,000	25,200	19,000
10	65,600	85,600	12,500	20	105,000	38,200	11,000	30	145,000	23,600	14,600
								31	127,000		11,100
Monthly mean discharge, in second-feet									85,900	64,300	12,420
Runoff, in inches									10.85	7.50	1.50

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17	May 18	May 19	May 20	May 21	May 22	May 23	May 24	May 25	May 26	May 27	May 28
4	13.42	59,100	14.78	72,000	15.77	82,200	16.87	94,400	18.38	112,000	18.69	115,000
8	13.83	62,800	15.45	78,700	15.76	82,100	17.85	106,000	18.78	116,000	19.45	124,000
N	14.25	66,700	15.93	83,900	15.80	82,500	18.38	112,000	18.85	117,000	20.75	140,000
4	14.43	68,500	16.13	86,100	15.77	82,200	18.43	112,000	18.63	115,000	22.50	161,000
8	14.41	68,300	16.04	85,100	15.80	82,500	18.19	110,000	18.33	111,000	23.31	171,000
12	14.40	68,200	15.88	83,400	16.21	87,000	18.10	108,000	18.28	111,000	22.80	165,000
	May 23	May 24	May 25	May 26	May 27	May 28						
4	21.76	152,000	19.75	128,000	19.14	121,000	19.71	127,000	20.32	134,000	21.11	144,000
8	21.01	143,000	19.78	128,000	19.70	127,000	20.31	134,000	20.86	141,000	21.81	152,000
N	20.75	140,000	19.64	126,000	19.91	130,000	20.57	137,000	21.10	144,000	22.17	157,000
4	20.43	136,000	19.31	123,000	19.67	127,000	20.32	134,000	20.86	141,000	22.02	155,000
8	20.13	132,000	18.87	117,000	19.28	122,000	19.87	129,000	20.47	136,000	21.66	151,000
12	19.82	129,000	18.74	116,000	19.20	121,000	19.80	128,000	20.48	136,000	21.58	150,000
	May 29	May 30	May 31	June 1	June 2	June 3						
4	21.82	153,000	22.22	157,000	19.89	129,000	18.95	118,000	18.60	114,000	18.63	115,000
8	22.67	163,000	21.80	152,000	20.15	132,000	19.20	121,000	19.05	120,000	19.11	120,000
N	23.49	173,000	21.32	146,000	20.00	131,000	19.25	122,000	19.15	121,000	19.28	122,000
4	23.74	176,000	20.71	139,000	19.56	125,000	18.95	118,000	18.88	118,000	19.17	121,000
8	23.35	172,000	20.12	132,000	19.09	120,000	18.52	115,000	18.46	115,000	19.03	119,000
12	22.78	164,000	19.77	128,000	18.85	117,000	18.32	111,000	18.30	111,000	18.93	118,000
	June 4	June 5	June 6	June 7	June 8	June 9						
4	18.92	118,000	17.68	104,000	16.69	92,400	16.57	91,100	16.70	92,500	16.39	89,000
8	18.92	118,000	17.59	103,000	16.91	94,800	17.04	96,300	17.15	97,600	16.70	92,500
N	18.83	117,000	17.46	101,000	16.99	95,800	17.23	98,500	17.30	99,300	16.76	93,200
4	18.57	114,000	17.19	98,100	16.80	93,600	16.99	95,800	16.99	95,800	16.46	89,800
8	18.19	110,000	16.88	94,500	16.46	89,800	16.59	91,300	16.56	91,000	16.03	85,000
12	17.87	106,000	16.65	92,000	16.28	87,800	16.40	89,100	16.31	88,100	15.77	82,200
	June 10	June 11	June 12	June 13	June 14	June 15						
4	15.88	83,400	15.36	77,800	15.52	79,400	14.03	64,600	14.33	67,500	13.02	55,500
8	16.39	89,000	15.67	81,100	15.57	80,000	13.99	64,200	14.31	67,300	12.99	55,200
N	16.56	91,000	15.96	84,300	15.49	79,100	14.01	64,400	14.10	65,200	13.01	55,400
4	16.30	88,000	15.87	83,300	15.14	75,600	14.04	64,700	13.87	63,100	12.95	54,800
8	15.79	82,400	15.62	80,500	14.69	71,100	14.18	66,000	13.53	60,100	12.84	53,900
12	15.38	78,000	15.53	79,500	14.27	66,900	14.32	67,400	13.20	57,100	12.70	52,600
	June 16	June 17	June 18	June 19	June 20	June 21						
4	13.28	57,700	12.59	51,600	11.84	45,600	11.29	41,100	11.06	39,200	10.82	37,500
8	13.29	57,800	12.54	51,200	11.70	44,400	11.39	41,900	10.94	38,300	10.92	38,200
N	13.03	55,500	12.55	51,200	11.60	43,600	11.43	42,200	10.88	37,900	11.17	40,000
4	12.99	55,100	12.38	49,900	11.52	43,000	11.37	41,700	10.83	37,500	11.43	42,100
8	12.78	53,200	12.20	48,400	11.43	42,300	11.28	41,000	10.81	37,400	11.60	43,500
12	12.57	51,500	12.09	47,600	11.34	41,600	11.20	40,400	10.80	37,300	11.77	44,800

Supplemental record.- May 29, 3 p.m., 23.76 ft., 177,000 sec.-ft.



A. CLEARWATER RIVER AT KAMIAH, IDAHO.

Courtesy of United States Forest Service.



B. FLOOD DAMAGE ON WHITEBIRD CREEK NEAR WHITEBIRD, IDAHO.

Courtesy of United States Forest Service.





## Lochsa River near Lowell, Idaho

Location.- Lat. 46°09', long. 115°35', in SW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 33, T. 33 N., R. 7 E., three-quarters of a mile upstream from Lowell post office, seven-eighths of a mile upstream from mouth, and  $\frac{1}{4}$  miles downstream from Pete King Creek.

Drainage area.- 1,180 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 24,700 second-feet and extended to peak stage.

Maxima.- May-June 1948: Discharge, 34,600 second-feet 5:30 a.m. May 29 (gage height, 13.62 feet).

1929 to April 1948: Discharge, 34,800 second-feet June 10, 1933 (gage height, 13.44 feet), from rating curve extended above 25,000 second-feet.

Remarks.- No diversion or regulation above station.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	7,600	21,900	4,120	11	8,200	15,700	2,160	21	22,000	8,100	1,810
2	6,910	22,400	3,830	12	8,360	14,100	2,070	22	24,800	8,430	1,570
3	6,700	23,100	3,490	13	9,880	13,200	1,950	23	21,900	7,120	1,430
4	7,630	20,800	3,250	14	10,900	11,700	1,850	24	21,300	6,520	1,560
5	7,170	18,400	3,050	15	10,000	10,200	1,760	25	23,500	6,180	1,270
6	7,840	17,800	2,840	16	10,900	9,700	1,670	26	25,700	5,850	1,210
7	10,100	18,600	2,690	17	13,600	9,080	1,610	27	27,600	5,360	1,220
8	9,570	18,500	2,540	18	15,900	7,940	1,610	28	30,000	4,960	1,940
9	8,700	17,600	2,390	19	16,100	7,450	1,650	29	31,900	4,660	2,440
10	8,360	16,900	2,260	20	20,200	7,120	1,860	30	24,800	4,380	1,900
								31	22,400		1,580
Monthly mean discharge, in second-feet									15,500	12,120	2,141
Runoff, in inches									15.14	11.46	2.09

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height		Discharge		Gage height		Discharge		Gage height		Discharge		Gage height		Discharge		Gage height		Discharge					
	May 17		May 18		May 19		May 20		May 21		May 22		May 23		May 24		May 25		May 26		May 27		May 28	
4	7.90	12,800	8.97	16,400	8.69	15,400	9.94	19,900	10.37	21,600	11.58	25,600												
8	7.98	13,100	8.93	16,300	8.61	15,100	9.89	19,700	10.39	21,600	11.40	25,700												
N	7.99	13,100	8.82	15,900	8.52	14,800	9.84	19,600	10.25	21,100	11.24	25,100												
4	8.15	13,600	8.74	15,600	8.77	15,700	9.97	20,000	10.33	21,400	11.05	24,300												
8	8.57	15,000	8.72	15,500	9.46	18,200	10.24	21,100	10.75	23,100	10.89	23,600												
12	8.80	15,800	8.70	15,400	9.84	19,600	10.40	21,700	11.30	25,300	10.82	23,300												
4	10.69	22,800	10.39	21,600	10.98	23,800	11.62	26,200	12.04	27,800	12.80	30,900												
8	10.50	22,100	10.17	20,800	10.78	23,000	11.41	25,300	11.82	26,900	12.63	30,200												
N	10.30	21,300	9.93	19,900	10.52	22,000	11.18	24,400	11.61	25,900	12.35	28,900												
4	10.20	20,900	10.05	20,300	10.68	22,600	11.36	25,100	11.82	26,800	12.20	28,200												
8	10.41	21,700	10.62	22,500	11.20	24,700	11.69	26,500	12.27	28,800	12.53	29,700												
12	10.50	22,100	10.92	23,700	11.53	26,100	11.99	27,800	12.70	30,800	13.42	33,900												

Supplemental record.- May 19, 2 p.m., 8.55 ft., 14,900 sec.-ft.; May 21, 2 p.m., 10.20 ft., 20,900 sec.-ft.; May 24, 2 p.m., 9.91 ft., 19,800 sec.-ft.; May 25, 2 a.m., 11.00 ft., 23,900 sec.-ft.; 2 p.m., 10.48 ft., 21,800 sec.-ft.; May 26, 2 p.m., 11.14 ft., 24,200 sec.-ft.; May 29, 2 a.m., 13.57 ft., 34,300 sec.-ft.; 5:30 a.m., 13.62 ft., 34,600 sec.-ft.; June 1, 2 p.m., 10.45 ft., 20,600 sec.-ft.; June 2, 2 a.m., 11.18 ft., 23,500 sec.-ft.; 2 p.m., 10.60 ft., 21,200 sec.-ft.; June 3, 2 a.m., 11.30 ft., 24,000 sec.-ft.; June 6, 2 p.m., 9.40 ft., 16,800 sec.-ft.; June 7, 2 p.m., 9.58 ft., 17,400 sec.-ft.; June 9, 2 a.m., 10.00 ft., 19,000 sec.-ft.; June 10, 2 a.m., 9.97 ft., 18,900 sec.-ft.; June 11, 3 a.m., 9.35 ft., 16,600 sec.-ft.; June 13, 2 p.m., 8.48 ft., 13,600 sec.-ft.

## South Fork Clearwater River near Elk City, Idaho

Location.- Lat. 45°49', long. 115°32', in NE $\frac{1}{4}$  sec. 25, T. 29 N., R. 7 E., at bridge on road to Orogrande, 0.2 mile upstream from Crooked River and  $4\frac{1}{2}$  miles west of Elk City.

Drainage area.- 261 square miles.

Gage-height record.- Wire-weight gage read twice daily except Sundays and except May 27-29, when gage was read once daily.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 2,890 second-feet and extended to peak stage. Discharge for periods of no gage-height record computed on basis of records for station near Grangeville.

Maxima.- May-June 1948: Discharge observed, 3,700 second-feet 7:35 a.m. May 29 (gage height, 13.06 feet).

1944 to April 1948: Discharge observed, 2,200 second-feet May 9, 1947 (gage height, 11.86 feet).

Remarks.- No diversion or regulation above station except for mining operations.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,070	2,060	446	11	1,330	1,050	225	21	2,800	892	209
2	950	1,800	446	12	1,340	925	219	22	3,390	930	149
3	898	1,760	367	13	1,430	800	200	23	3,000	876	112
4	898	1,620	350	14	1,620	700	193	24	2,700	710	86
5	860	1,430	329	15	1,530	640	184	25	2,620	670	85
6	881	1,400	312	16	1,700	640	179	26	2,820	660	85
7	1,660	1,250	277	17	2,200	645	176	27	2,900	600	88
8	1,560	1,150	265	18	2,540	545	190	28	2,750	550	181
9	1,450	1,130	240	19	2,240	545	206	29	3,700	500	308
10	1,370	1,040	230	20	2,810	520	281	30	2,750	460	173
								31	2,250		147
Monthly mean discharge, in second-feet									2,001	950	224
Runoff, in inches									8.84	4.06	.99

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
May 17			May 25			June 3			June 12		
7:30	11.78	2,110	7:30	12.22	2,580	7:25	11.38	1,740	7:20	10.08	914
4:05	11.96	2,300	4:50	12.28	2,660	4:40	11.42	1,780	4:20	10.12	936
May 18			May 26			June 4			June 14		
7:25	12.38	2,780	7:25	12.42	2,820	7:20	11.24	1,630	7:20	9.70	715
4:20	11.98	2,320	4:40	12.42	2,820	4:50	11.20	1,600	4:45	9.64	685
May 19			May 27			June 5			June 15		
7:20	11.88	2,210	7:30a	12.48	2,900	7:25	10.98	1,450	7:20	9.58	655
4:20	11.94	2,270				4:30	10.92	1,410	4:35	9.52	615
May 20			May 28			June 7			June 16		
7:30	12.44	2,850	1:40p	12.36	2,750	7:30	10.68	1,260	7:25	9.50	615
4:35	12.38	2,780				4:25	10.64	1,230	4:40	9.60	665
May 21			May 29			June 8			June 17		
7:25	12.42	2,820	7:35a	13.06	3,700						
4:10	12.38	2,780				7:25	10.52	1,160	7:25	9.58	655
May 22						4:25	10.48	1,140	4:30	9.54	635
7:25	12.86	3,400				June 9			June 18		
6:20	12.84	3,380				7:30	10.46	1,130	7:30	9.38	555
May 24						4:30	10.46	1,130	4:35	9.34	535
						June 10			June 19		
7:25	12.18	2,540				7:20	10.32	1,050	7:20	9.40	565
1	12.55	2,980				4:10	10.28	1,020	4:30	9.32	525
2:15	12.40	2,800	7:25	11.50	1,850	June 11			June 21		
4:45	12.14	2,490	4:45	11.38	1,740						
						7:30	10.28	1,020	7:25	9.96	845
						4:40	10.36	1,070	4:45	10.14	942

## South Fork Clearwater River near Grangeville, Idaho

Location.- Lat. 45°55', long. 116°01', in SE¼NW¼ sec. 30, T. 30 N., R. 4 E., just downstream from powerhouse of Washington Water Power Co., 6 miles southeast of Grangeville.

Drainage area.- 865 square miles.

Gage-height record.- Water-stage recorder graph May 1-27, July 10-31. Staff gage read twice daily May 28 to July 9; graph based on gage readings used May 28-31.

Discharge record.- Stage-discharge relation defined by current-meter measurements. Shifting-control method used June 23 to July 31.

Maxima.- May-June 1948: Discharge, 12,600 second-feet 8 a.m. May 29 (gage height, 12.50 feet, from graph based on gage readings).

1910-16, 1923 to April 1948: Discharge observed, 9,830 second-feet May 30, 1912 (gage height, 9.7 feet), from rating curve extended above 6,500 second-feet.

Remarks.- Diurnal fluctuation at low flow caused by power plant just above station. No diversion for irrigation. Water-stage recorder inspected and gage readings furnished by Washington Water Power Co. in connection with a Federal Power Commission project.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2,970	7,960	2,360	11	3,930	5,410	1,050	21	8,340	4,600	892
2	2,670	7,880	2,190	12	3,950	4,890	1,010	22	10,200	4,820	759
3	2,500	8,580	1,980	13	4,460	4,890	946	23	10,200	4,200	683
4	2,530	7,410	1,860	14	5,190	4,300	886	24	9,850	3,900	632
5	2,390	6,640	1,680	15	5,070	3,850	840	25	10,100	3,630	600
6	2,770	6,450	1,520	16	5,120	3,850	802	26	10,300	2,980	573
7	4,360	6,450	1,430	17	6,410	3,590	759	27	10,300	2,980	583
8	4,490	6,450	1,350	18	7,440	3,240	840	28	10,600	2,730	1,030
9	4,280	6,000	1,260	19	7,320	3,210	940	29	11,300	2,520	1,430
10	4,070	5,600	1,120	20	8,130	2,980	1,100	30	9,300	2,350	899
								31	8,580		747
Monthly mean discharge, in second-feet.....									6,407	4,821	1,121
Runoff, in inches.....									8.54	6.22	1.49

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4 8 N 4 8 12	8.89	5,920	10.11	7,580	9.86	7,200	10.49	8,200	10.61	8,420	11.09	9,340
	9.12	6,220	10.11	7,580	9.83	7,160	10.58	8,360	10.56	8,330	11.37	9,930
	9.25	6,380	10.06	7,500	9.81	7,130	10.37	8,000	10.39	8,030	11.60	10,500
	9.31	6,460	9.97	7,360	9.81	7,130	10.25	7,800	10.41	8,070	11.78	10,900
	9.72	7,010	9.91	7,280	10.12	7,590	10.48	8,190	10.68	8,540	11.70	10,700
	9.92	7,290	9.98	7,380	10.38	8,020	10.64	8,470	10.84	8,850	11.61	10,500
May 23		May 24		May 25		May 26		May 27		May 28		
4 8 N 4 8 12	11.57	10,400	11.37	9,930	11.31	9,800	11.44	10,100	11.52	10,300	11.77	10,800
	11.44	10,100	11.30	9,780	11.28	9,740	11.40	10,000	11.45	10,100	11.70	10,700
	11.36	9,910	11.22	9,610	11.26	9,700	11.36	9,910	11.43	10,100	11.54	10,300
	11.40	10,000	11.21	9,590	11.32	9,820	11.41	10,000	11.46	10,100	11.50	10,200
	11.50	10,200	11.33	9,850	11.38	9,960	11.56	10,400	11.66	10,600	11.59	10,500
	11.44	10,100	11.38	9,960	11.50	10,200	11.67	10,600	11.73	10,800	11.80	10,900
May 29		May 30		May 31		June 1		June 2		June 3		
4 8 N 4 8 12	12.12	11,700	11.33	9,850	11.03	9,220						
	12.50	12,600	11.10	9,360	10.80	8,770						
	12.07	11,500	10.81	8,790	10.45	8,140						
	11.82	11,000	10.77	8,710	10.37	8,000						
	11.66	10,600	11.00	9,160	10.60	8,400						
	11.57	10,400	11.12	9,400	10.68	8,540						

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
June 1			June 6			June 12			June 17		
8	10.40	8,050	8	9.40	6,580	8	8.20	5,020	8	7.20	3,720
4:30	10.30	7,880	4:30	9.20	6,320	4:30	8.00	4,760	4:30	7.00	3,460
June 2			June 7			June 13			June 18		
8	10.40	8,050	8	9.40	6,580	8	8.20	5,020	8	6.90	3,330
4:30	10.20	7,720	4:30	9.20	6,320	4:30	8.00	4,760	4:30	6.76	3,150
June 3			June 8			June 14			June 19		
8	10.70	8,580	8	9.40	6,580	8	7.80	4,500	8	6.86	3,280
4:30	10.70	8,580	4:30	9.20	6,320	4:30	7.50	4,110	4:30	6.76	3,150
June 4			June 9			June 15			June 20		
8	10.20	7,720	8	9.10	6,190	8	7.40	3,980	8	6.64	3,010
4:30	9.80	7,120	4:30	8.80	5,800	4:30	7.20	3,720	4:30	6.60	2,960
June 5			June 10			June 16			June 21		
8	9.50	6,710	8	8.80	5,800	8	7.30	3,850	8	7.56	4,190
4:30	9.40	6,580	4:30	8.50	5,410	4:30	7.30	3,850	4:30	8.20	5,020
			June 11								
			8	8.50	5,410						
			4:30	8.50	5,410						

## North Fork Clearwater River at Bungalow ranger station, Idaho

Location.- Lat. 46°38', long. 115°30', in sec. 18, T. 38 N., R. 8 E., at Bungalow ranger station, 300 feet downstream from mouth of Orogrande Creek, 1,000 feet downstream from steel highway bridge, and 17 miles northeast of Pierce.

Drainage area.- 996 square miles.

Gage-height record.- Water-stage recorder graph except June 7 to 9 a.m. June 13, when there was no gage-height record.

Discharge record.- Stage-discharge relation defined by current-meter measurements to 20,000 second-feet and extended to peak stage on basis of velocity-area study. Discharge for period June 7-13 computed on basis of records for station near Ahsahka.

Maxima.- May-June 1948: Discharge, 27,400 second-feet 1:30 a.m. May 29 (gage height, 11.13 feet).

1944 to April 1948: Discharge, 19,700 second-feet May 8, 1947 (gage height, 9.17 feet).

Remarks.- No diversion or regulation above station. Water-stage recorder inspected by U. S. Forest Service ranger at Bungalow ranger station.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	7,520	17,800	3,530	11	8,240	12,400	2,240	21	19,000	6,300	1,890
2	6,800	17,600	3,340	12	8,470	11,000	2,110	22	19,900	5,840	1,680
3	6,770	17,900	3,140	13	10,200	9,800	1,990	23	17,600	5,560	1,550
4	7,550	16,500	2,990	14	10,300	9,020	1,920	24	17,800	5,010	1,480
5	6,960	14,900	2,860	15	9,760	8,110	1,870	25	19,100	4,670	1,430
6	7,980	14,200	2,740	16	10,300	7,850	1,820	26	20,600	4,700	1,400
7	10,200	14,000	2,650	17	12,500	7,250	1,750	27	22,900	4,500	1,460
8	9,940	13,800	2,550	18	13,800	6,580	1,710	28	24,600	4,150	2,490
9	9,020	13,000	2,410	19	14,100	6,210	1,990	29	25,200	3,900	2,670
10	8,410	12,800	2,280	20	17,400	6,020	2,220	30	20,300	3,700	1,820
								31	18,700		1,580
Monthly mean discharge, in second-feet									13,610	9,502	2,179
Runoff, in inches									15.75	10.64	2.52

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	7.14	12,200	7.69	14,200	7.53	13,600	8.48	17,000	8.84	18,400		
8	7.08	11,900	7.61	13,800	7.45	13,500	8.40	16,800	8.70	17,900	9.30	20,200
N	7.05	11,800	7.53	13,600	7.40	13,100	8.32	16,500	8.64	17,700		
4	7.16	12,200	7.50	13,500	7.55	13,600	8.51	17,100	8.92	18,700	9.05	19,200
8	7.57	13,700	7.55	13,600	8.15	15,800	8.96	18,800	9.53	21,000		
12	7.75	14,400	7.59	13,800	8.50	17,100	9.01	19,000	9.75	21,900	8.86	18,500
	May 23		May 24		May 25		May 26		May 27		May 28	
4	8.68	18,800	8.63	17,600	8.97	18,900	9.38	20,500	9.81	22,100	10.67	25,600
8	8.53	17,200	8.46	17,000	8.76	18,100	9.12	19,500	9.57	21,200	10.34	24,300
N	8.50	17,100	8.32	16,500	8.64	17,700	8.95	18,800	9.47	20,800	10.08	23,200
4	8.58	17,400	8.50	17,100	8.86	18,500	9.22	19,900	9.85	22,300	10.06	23,100
8	8.73	18,000	9.08	19,300	9.50	20,900	9.94	22,700	10.75	25,900	10.41	24,500
12	8.76	18,100	9.23	19,900	9.68	21,600	10.03	23,000	11.02	27,000	10.98	26,800
	May 29		May 30		May 31		June 1		June 2		June 3	
4	11.01	26,900	9.55	21,100	9.13	19,500	8.81	18,300	8.68	17,800	8.73	18,000
8	10.95	26,700	9.23	19,900	8.85	18,400	8.58	17,400	8.48	17,000	8.64	17,700
N	10.64	25,500	9.03	19,100	8.64	17,700	8.41	16,800	8.36	16,600	8.66	17,700
4	10.22	25,800	8.07	19,300	8.68	17,800	8.48	17,000	8.52	17,200	8.68	17,800
8	10.14	23,500	9.45	20,800	8.95	18,800	8.85	18,400	8.89	18,600	8.76	18,100
12	9.92	22,600	9.49	20,900	9.04	19,200	8.90	18,600	8.91	18,600	8.65	17,700
	June 4		June 5		June 6		June 7		June 8		June 9	
4												
8												
N	8.24	16,200	7.80	14,500	7.62	13,900						
4			7.78	14,400	7.52	13,600						
8	8.22	16,100	7.88	14,800	7.62	13,900						
12	8.17	15,900	7.89	14,900	7.89	14,900						
	June 10		June 11		June 12		June 13		June 14		June 15	
4												
8												
N									6.25	9,020	5.98	8,110
4												
8												
12												
	June 16		June 17		June 18		June 19		June 20		June 21	
4												
8												
N	5.90	7,850	5.72	7,250	5.51	6,580	5.39	6,210	5.33	6,020	5.42	6,300
4												
8												
12												

\* Mean for the day.

## North Fork Clearwater River near Ahsahka, Idaho

Location.- Lat. 46°31', long. 116°18', in SE $\frac{1}{4}$  sec. 26, T. 37 N., R. 1 E., at Bruce's Eddy,  $1\frac{1}{2}$  miles northeast of Ahsahka and 2 miles upstream from mouth.

Drainage area.- 2,440 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge, 55,600 second-feet noon May 29 (gage height, 25.79 feet).

1926 to April 1948: Discharge, 100,000 second-feet Dec. 23, 1933 (gage height, 35.5 feet, from floodmarks), from rating curve extended above 41,000 second-feet by logarithmic plotting.

Remarks.- No diversion or regulation above station.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	15,500	36,200	6,830	11	18,700	24,400	4,270	21	37,400	11,600	4,360
2	13,800	35,200	6,490	12	18,300	21,700	4,130	22	43,200	11,300	3,570
3	13,000	35,800	6,020	13	21,600	19,100	3,930	23	40,700	10,300	3,240
4	15,200	34,600	5,750	14	22,500	18,000	3,750	24	39,400	9,540	3,110
5	14,200	30,300	5,490	15	19,800	15,800	3,640	25	41,000	9,100	2,960
6	15,100	27,900	5,230	16	20,800	15,000	3,570	26	42,800	8,840	2,840
7	21,100	27,600	5,020	17	24,100	14,000	3,430	27	45,300	8,670	2,840
8	23,200	27,000	4,860	18	27,700	12,600	3,320	28	49,500	7,960	5,460
9	21,700	25,600	4,600	19	27,100	12,000	3,570	29	52,000	7,500	8,100
10	20,000	25,100	4,390	20	33,800	11,200	4,780	30	43,200	7,220	5,120
								31	39,500		4,040
Monthly mean discharge, in second-feet.....									28,430	18,700	4,475
Runoff, in inches.....									15.43	8.55	2.11

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	15.95	22,900	17.38	26,800	17.47	27,100	19.20	32,200	20.96	37,900	21.76	40,600
8	16.43	24,200	18.04	28,700	17.51	27,200	19.95	34,600	21.22	38,700	22.32	42,500
N	16.78	25,100	18.07	28,800	17.47	27,100	20.09	35,000	20.98	37,900	22.88	44,500
4	16.57	24,500	17.82	28,100	17.26	26,500	19.87	34,300	20.63	36,800	23.19	45,600
8	16.44	24,200	17.60	27,400	17.58	26,800	19.66	34,300	20.53	36,400	22.96	44,800
12	16.78	25,100	17.49	27,100	18.12	29,000	20.37	35,900	20.98	37,900	22.54	43,300
	May 23		May 24		May 25		May 26		May 27		May 28	
4	22.06	41,600	21.77	40,600	22.01	41,400	22.52	43,200	23.12	45,400	24.40	50,200
8	21.70	40,400	21.74	40,500	22.36	42,700	22.92	44,700	23.51	46,800	24.98	52,400
N	21.51	39,700	21.47	39,600	22.14	41,900	22.63	43,600	23.30	46,000	24.69	51,300
4	21.62	40,100	21.06	38,200	21.57	39,900	22.12	41,800	22.83	44,300	24.02	48,700
8	21.71	40,400	20.92	37,700	21.44	39,500	21.97	41,300	22.78	44,200	23.65	47,300
12	21.70	40,400	21.43	39,400	21.96	41,300	22.53	43,300	23.49	46,700	23.61	47,200
	May 29		May 30		May 31		June 1		June 2		June 3	
4	24.19	49,400	23.53	46,900	22.09	41,700	20.84	37,500	20.43	36,100	20.39	36,000
8	25.15	53,000	23.05	45,100	22.16	42,000	20.89	37,600	20.59	36,600	20.59	36,600
N	25.79	55,600	22.44	42,900	21.66	40,200	20.68	36,900	20.31	35,700	20.35	35,800
4	25.46	54,200	21.79	40,700	20.94	37,800	20.14	35,200	19.82	34,200	20.17	35,300
8	24.85	51,900	21.40	39,300	20.60	36,700	19.87	34,300	19.65	33,600	20.28	35,600
12	24.04	48,800	21.54	39,800	20.66	36,900	20.08	35,000	19.97	34,700	20.52	36,400
	June 4		June 5		June 6		June 7		June 8		June 9	
4	20.51	36,400	19.08	31,800	18.07	28,800	17.93	28,400	17.80	28,000	17.31	26,600
8	20.34	35,800	18.89	31,300	18.05	28,800	18.04	28,700	17.87	28,200	17.36	26,700
N	20.01	34,800	18.60	30,400	17.80	28,000	17.78	28,000	17.54	27,300	17.04	25,800
4	19.65	33,600	18.28	29,400	17.45	27,000	17.59	26,800	17.13	26,100	16.62	24,700
8	19.29	32,500	17.99	28,600	17.31	26,600	17.23	26,400	16.95	25,600	16.45	24,200
12	19.16	32,100	17.97	28,500	17.64	27,600	17.56	27,300	17.16	26,200	16.63	24,700
	June 10		June 11		June 12		June 13		June 14		June 15	
4	16.98	25,700	16.43	24,200	16.12	23,300	14.53	19,200	14.47	19,100	13.34	16,400
8	17.25	26,400	16.82	25,200	15.81	22,500	14.41	18,900	14.31	18,700	13.22	16,200
N	17.15	26,200	16.68	24,800	15.60	21,900	14.34	18,700	14.13	18,200	13.12	15,900
4	16.61	24,600	16.38	24,000	15.15	20,800	14.36	18,800	13.76	17,400	12.89	15,400
8	16.16	23,400	16.54	24,400	14.77	19,800	14.57	19,300	13.49	16,800	12.69	15,000
12	16.31	23,600	16.48	24,300	14.65	19,500	14.61	19,400	13.41	16,600	12.71	15,100
	June 16		June 17		June 18		June 19		June 20		June 21	
4	12.80	15,200	12.36	14,300	11.71	13,000	11.25	12,200	10.81	11,300	10.67	11,100
8	12.89	15,400	12.42	14,500	11.61	12,800	11.23	12,100	10.74	11,200	10.86	11,400
N	12.77	15,200	12.24	14,100	11.54	12,700	11.24	12,100	10.74	11,200	11.10	11,900
4	12.63	14,900	12.08	13,800	11.36	12,400	11.19	12,000	10.73	11,200	11.14	11,900
8	12.56	14,700	11.89	13,400	11.26	12,200	10.98	11,700	10.62	11,000	11.14	11,900
12	12.45	14,500	11.75	13,100	11.26	12,200	10.88	11,500	10.59	11,000	11.11	11,900

## Potlatch Creek at Kendrick, Idaho

Location.- Lat. 46°37', long. 116°39', in NW¼ sec. 25, T. 38 N., R. 3 W., at Mill Street Bridge in Kendrick, 0.9 mile downstream from Bear Creek and 3.2 miles upstream from Middle Potlatch Creek.

Drainage area.- 460 square miles.

Gage-height record.- Wire-weight gage read once daily.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge observed, 7,820 second-feet 2:10 p.m. May 22 (gage height, 10.53 feet).

1945 to April 1948: Discharge, 15,000 second-feet Feb. 26, 1948 (gage height, 12.6 feet, from floodmark), by slope-area method.

Remarks.- No diversion or regulation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	759	867	156	11	2,650	269	76	21	1,760	411	158
2	675	660	125	12	2,410	588	89	22	3,800	464	83
3	594	617	116	13	2,460	340	64	23	4,490	388	65
4	660	654	101	14	1,950	325	60	24	4,080	296	65
5	679	480	107	15	1,370	265	56	25	1,780	262	58
6	617	444	101	16	1,050	435	53	26	1,330	229	53
7	775	379	99	17	959	397	52	27	992	203	52
8	2,880	323	87	18	874	288	45	28	837	190	93
9	5,280	298	87	19	801	402	60	29	1,920	150	444
10	3,720	250	85	20	2,940	425	167	30	1,450	156	507
								31	1,110		197
Monthly mean discharge, in second-feet .....									1,858	381	108
Runoff, in inches .....									4.66	0.93	0.27

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
6a	May 17 6.99	959	7:30p	May 26 7.38	1,330	Noon	June 4 6.56	654	9:35a	June 13 5.95	340
6a	May 18 6.88	874	10a	May 27 7.03	992	8:10p	June 5 6.25	480	4:40a	June 14 5.91	323
5:30a	May 19 6.78	801	10:25a	May 28 6.83	837	10:20a	June 6 6.18	444	N	June 15 5.76	265
5:55a	May 20 8.41	2,940	5:30	May 29 7.79	1,880	5:45	June 7 6.07	392	7:10a	June 16 6.16	435
			4:20	7.84	1,950	3:30	6.01	366			
6:05a	May 21 7.71	1,760	6:50	7.85	1,970					June 17 6.08	397
				May 30 7.47	1,430	6:05a	June 8 5.93	332	8:35a		
6	May 22 7.31	1,250	8:05a			6:20p	5.89	315		June 18 5.82	288
2:10	10.53	7,820		May 31 7.17	1,110	9:10a	June 9 5.82	288		June 19 6.09	402
5:30	10.08	6,700	7:30a						8:05a		
	May 23 9.17	4,490	8:25a	June 1 6.87	867	1:25p	June 10 5.72	250	4p	June 20 6.14	425
	May 24 8.98	4,080	1:25p	June 2 6.57	660	9:50a	June 11 5.77	269	9:00a	June 21 6.11	411
3:10p	May 25 7.73	1,780	3:15p	June 3 6.50	617	8:15a	June 12 6.45	588			

Walla Walla River Basin

South Fork Walla Walla River near Milton, Oreg.

Location.- Lat. 45°40', long. 118°10', in NE $\frac{1}{4}$  sec. 15, T. 4 N., R. 37 E., 1 mile upstream from Pacific Power & Light Co.'s penstock intake and 13 miles southeast of Milton. Altitude of gage, about 2,050 feet (from river-profile map).

Drainage area.- 63 square miles.

Gage-Height record.- Water-stage recorder graph except for periods 11 a.m. May 30 to 11 a.m. June 1, 10 p.m. June 4 to 1 p.m. June 15, when there was no gage-height record.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 680 second-feet and extended to peak stage. Discharge for periods of no gage-height record computed on basis of records for North Fork Walla Walla River near Milton.

Maxima.- May-June 1948: Discharge, 1,180 second-feet 4 p.m. May 22 (gage height, 3.20 feet).

1906-17, 1931 to April 1948: Discharge, 2,430 second-feet Dec. 12, 1946 (gage height, 4.20 feet).

Maximum stage known, about 6 feet Mar. 31, 1931, present site and datum.

Remarks.- No diversion or regulation above station.

*Mean discharge, in second-feet, 1948*

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	268	500	205	11	498	460	162	21	665	480	144
2	261	568	196	12	450	420	157	22	996	429	142
3	315	552	189	13	634	380	153	23	909	370	140
4	420	494	183	14	534	350	153	24	805	322	138
5	355	470	189	15	492	310	151	25	738	290	138
6	370	460	175	16	528	330	151	26	788	266	136
7	409	485	186	17	542	309	149	27	863	243	142
8	498	510	170	18	490	295	149	28	788	232	178
9	706	510	165	19	569	296	146	29	600	226	149
10	528	490	160	20	625	302	146	30	518	218	142
								31	480		140
Monthly mean discharge, in second-feet .....									569	386	159
Runoff, in inches .....									10.41	6.83	2.91

*Gage height, in feet, and discharge, in second-feet, at indicated time, 1948*

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	2.53	561	2.44	504	2.49	534	2.59	603	2.70	690	2.87	833
6	2.51	547	2.42	492	2.52	554	2.57	589	2.65	650	3.00	960
N	2.50	540	2.41	486	2.53	561	2.53	551	2.61	618	3.19	1,170
4	2.49	534	2.38	468	2.56	582	2.61	618	2.62	626	3.20	1,180
8	2.47	522	2.39	474	2.61	618	2.72	706	2.67	666	3.08	1,050
12	2.46	516	2.46	516	2.61	618	2.75	730	2.77	746	3.04	1,000
	May 23		May 24		May 25		May 26		May 27		May 28	
4	3.02	920	2.92	820	2.79	702	2.85	755	2.93	830	3.01	910
8	2.97	870	2.84	746	2.75	670	2.79	702	2.88	782	2.92	820
N	2.91	810	2.78	694	2.75	670	2.74	662	2.88	782	2.86	764
4	3.00	900	2.89	791	2.87	773	2.90	800	2.94	840	2.80	710
8	3.09	990	3.03	930	2.94	840	3.07	970	3.05	950	2.78	694
12	3.03	930	2.86	764	2.88	782	3.00	900	3.10	1,000	2.74	662
	May 29		May 30		May 31		June 1		June 2		June 3	
4	2.70	630	2.57	542					2.59	554	2.62	574
8	2.67	609	2.54	524					2.56	536	2.59	554
N	2.64	588					2.54	524	2.54	524	2.57	542
4	2.63	581					2.62	574	2.63	581	2.57	542
8	2.63	581					2.66	602	2.69	623	2.56	536
12	2.60	560					2.63	581	2.66	602	2.54	524
	June 4		June 5		June 6		June 7		June 8		June 9	
4	2.52	512										
8	2.51	506										
N	2.48	488										
4												
8												
12												
	June 10		June 11		June 12		June 13		June 14		June 15	
4												
8												
N												
4											2.16	317
8											2.24	355
12											2.24	355
	June 16		June 17		June 18		June 19		June 20		June 21	
4	2.20	335	2.16	317	2.11	294	2.14	308	2.09	286	2.32	396
8	2.18	326	2.15	312	2.10	290	2.11	294	2.08	282	2.61	567
N	2.18	326	2.14	308	2.09	286	2.10	290	2.08	282	2.56	536
4	2.19	330	2.13	304	2.09	286	2.09	286	2.16	317	2.50	500
8	2.18	326	2.13	304	2.13	304	2.10	290	2.20	335	2.47	482
12	2.17	322	2.12	299	2.18	326	2.10	290	2.18	326	2.45	470

Supplemental record.- May 22, 2 p.m., 315 ft., 1,120 sec.-ft., 5 p.m., 3.02 ft., 982 sec.-ft., 10 p.m., 3.10 ft., 1,070 sec.-ft.; May 27, 10 p.m., 315 ft., 1,060 sec.-ft.



## North Fork Walla Walla River near Milton, Oreg.

Location.- Lat. 45°54', long. 118°18', in NW $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 22, T. 5 N., R. 36 E. at bridge half a mile upstream from confluence with South Fork and 4.5 miles southeast of Milton. Datum of gage is 1,405.69 feet above mean sea level, datum of 1929.

Drainage area.- 47 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 350 second-feet and extended to peak stage. Shifting-control method used May 1-21.

Maxima.- May-June 1948: Discharge, 570 second-feet 5 p.m. May 22 (gage height, 5.92 feet).

1929 to April 1948: Discharge, 1,980 second-feet Dec. 12, 1946 (gage height, 6.97 feet).

Remarks.- Diversions above station for irrigation of about 220 acres; no regulation.

Mean discharge, in second-feet, 1948.

mean discharge, in second-feet, 1947											
Day	May	June	July	Day	May	June	July	Day	May	June	July
1	100	272	54	11	148	170	36	21	231	298	15
2	94	276	47	12	185	148	34	22	470	268	15
3	100	274	42	13	300	142	28	23	431	209	15
4	127	244	39	14	254	128	22	24	416	160	15
5	140	218	44	15	200	122	18	25	337	130	15
6	140	214	42	16	221	126	19	26	338	111	14
7	170	225	47	17	199	108	16	27	366	95	14
8	252	229	40	18	167	100	16	28	500	77	47
9	267	219	38	19	184	100	13	29	428	64	38
10	165	196	36	20	168	102	15	30	328	61	25
								31	288		18
Monthly mean discharge, in second-feet.....									249	170	28.2
Runoff, in inches.....									6.10	4.02	0.69

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	4.80	200	4.76	173	4.77	176	4.67	150	4.83	179	5.57	412
8	4.79	197	4.76	173	4.81	188	4.69	155	4.86	188	5.79	510
N	4.80	200	4.72	162	4.80	185	4.73	165	4.90	200	5.71	474
4	4.80	200	4.69	155	4.79	182	4.77	176	5.02	237	5.87	546
8	4.79	197	4.67	150	4.81	188	4.80	185	5.21	304	5.67	456
12	4.76	188	4.85	194	4.77	176	4.79	182	5.38	372	5.59	420
	May 23		May 24		May 25		May 26		May 27		May 28	
4	5.52	389	5.68	461	5.41	344	5.36	324	5.39	338	5.82	524
8	5.47	368	5.58	416	5.39	336	5.35	320	5.45	360	5.78	506
N	5.57	412	5.51	384	5.36	324	5.39	336	5.40	340	5.75	492
4	5.75	492	5.59	420	5.37	328	5.45	360	5.38	332	5.75	492
8	5.70	470	5.51	384	5.40	340	5.45	352	5.55	402	5.75	492
12	5.75	492	5.46	364	5.40	340	5.39	336	5.70	470	5.75	492
	May 29		May 30		May 31		June 1		June 2		June 3	
4	5.64	443	5.37	328	5.26	286	5.21	268	5.21	268	5.23	276
8												
N	5.57	412	5.34	316	5.24	279	5.21	268	5.23	276	5.21	268
4												
8	5.46	364	5.34	316	5.24	279	5.24	279	5.27	290	5.20	265
12												
	June 4		June 5		June 6		June 7		June 8		June 9	
4	5.15	248	5.06	218	5.04	212	5.07	221	5.10	230	5.06	218
8												
N	5.12	237	5.04	212	5.04	212	5.08	224	5.07	221	5.04	212
4												
8	5.10	230	5.05	215	5.08	224	5.11	234	5.13	240	5.05	215
12												
	June 10		June 11		June 12		June 13		June 14		June 15	
4	5.01	203	4.91	173	4.83	152	4.79	142	4.75	132	4.71	122
8											4.69	118
N											4.67	113
4	4.96	188	4.88	165	4.78	140	4.79	142	4.72	122	4.66	111
8											4.75	132
12	4.94	182	4.86	160	4.80	145	4.77	138	4.71	122	4.82	150
	June 16		June 17		June 18		June 19		June 20		June 21	
4	4.72	125	4.66	111	4.61	99	4.63	104	4.57	91	5.00	200
8											5.51	384
N											5.42	348
4	4.71	122	4.63	104	4.59	95	4.59	95	4.64	106	5.37	328
8											5.33	312
12	4.68	115	4.62	102	4.66	111	4.58	93	4.72	125	5.31	304

Supplemental record.- May 22, 5 p.m., 5.92 ft., 570 sec.-ft.; May 27, 6 a.m., 5.53 ft., 394 sec.-ft.; May 28, 6 a.m., 5.87 ft., 546 sec.-ft.

## Mill Creek near Walla Walla, Wash.

Location.- Lat. 46°00', long. 118°07', in SE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 12, T. 6 N., R. 37 E., 4 miles downstream from city of Walla Walla diversion dam,  $\frac{1}{2}$  miles upstream from Blue Creek, and  $1\frac{1}{2}$  miles southeast of Walla Walla. Datum of gage is 2,000 feet above mean sea level, unadjusted.

Drainage area.- 54 square miles.

Gage-height record.- Water-stage recorder graph except June 28 to July 2, July 8-10.

Discharge record.- Stage-discharge relation defined by current-meter measurements. Gage heights used to hundredths. Shifting-control method used May 1 to July 31. Discharges for periods of no gage-height record computed on basis of records for nearby streams.

Maxima.- May-June 1948: Discharge, 873 second-feet 5 a.m. May 9 (gage height, 16.34 feet).

1913-17, 1938, 1939 to April 1948: Discharge, 1,880 second-feet Dec. 28, 1945 (gage height, 17.85 feet).

Remarks.- City of Walla Walla diverts about 22 second-feet 4 miles above gage for municipal use.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	204	193	70	11	323	125	49	21	369	132	44
2	187	194	67	12	287	112	48	22	466	115	44
3	200	193	67	13	437	112	48	23	464	106	45
4	238	163	64	14	359	103	48	24	397	97	44
5	233	146	69	15	299	104	49	25	400	90	44
6	248	146	64	16	293	101	49	26	394	86	42
7	293	147	65	17	281	93	49	27	398	80	48
8	487	154	62	18	229	90	47	28	343	78	70
9	684	145	58	19	298	89	47	29	254	75	67
10	377	134	53	20	356	90	47	30	212	72	60
								31	204		42
Monthly mean discharge, in second-feet .....										329	119
Runoff, in inches .....										7.03	2.46
											1.15

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	15.58	299	15.48	243	15.53	275	15.67	359	15.68	371	15.75	413
8	15.58	299	15.46	233	15.56	293	15.65	347	15.67	365	15.87	485
N	15.55	281	15.44	222	15.56	293	15.64	341	15.65	347	15.85	473
4	15.53	270	15.43	218	15.58	305	15.64	353	15.66	359	15.88	491
8	15.51	259	15.42	213	15.62	329	15.69	371	15.65	353	15.88	491
12	15.49	248	15.48	243	15.67	359	15.70	377	15.74	407	15.87	485
	May 23		May 24		May 25		May 26		May 27		May 28	
4	15.86	485	15.72	401	15.72	407	15.72	407	15.68	389	15.66	377
8	15.85	479	15.72	401	15.71	401	15.69	383	15.66	377	15.63	359
N	15.82	461	15.69	383	15.67	377	15.66	371	15.65	371	15.60	341
4	15.81	455	15.69	383	15.69	389	15.66	383	15.65	371	15.57	323
8	15.81	455	15.72	401	15.72	407	15.72	407	15.72	413	15.55	311
12	15.74	413	15.74	413	15.74	419	15.72	407	15.70	401	15.52	293
	May 29		May 30		May 31		June 1		June 2		June 3	
4	15.49	281	15.38	222	15.35	213	15.32	200	15.29	191	15.32	204
8	15.46	264	15.36	213	15.33	204	15.30	191	15.29	191	15.30	196
N	15.43	248	15.34	204	15.31	196	15.29	187	15.28	187	15.29	191
4	15.41	238	15.33	200	15.31	196	15.30	191	15.29	191	15.29	191
8	15.40	233	15.36	213	15.33	204	15.30	191	15.32	204	15.27	182
12	15.40	233	15.36	213	15.33	204	15.31	196	15.33	209	15.25	174
	June 4		June 5		June 6		June 7		June 8		June 9	
4	15.24	174	15.17	150	15.16	150	15.16	150	15.16	154	15.15	150
8	15.22	168	15.16	146	15.16	150	15.15	146	15.15	150	15.13	143
N	15.20	160	15.15	143	15.11	135	15.14	143	15.13	143	15.13	143
4	15.19	157	15.15	143	15.14	143	15.14	143	15.13	143	15.13	143
8	15.19	157	15.16	146	15.16	150	15.16	150	15.20	169	15.13	143
12	15.17	150	15.16	146	15.16	150	15.16	150	15.17	157	15.13	143
	June 10		June 11		June 12		June 13		June 14		June 15	
4	15.11	140	15.07	129	15.01	115	15.02	118	14.96	106	14.94	101
8	15.10	137	15.07	129	15.01	115	15.00	113	14.95	104	14.95	104
N	15.08	132	15.06	126	15.00	113	15.00	113	14.95	104	14.94	101
4	15.07	129	15.05	123	14.97	106	14.98	108	14.94	101	14.93	99
8	15.07	129	15.04	121	14.98	108	14.98	108	14.94	101	14.97	108
12	15.07	129	15.03	118	15.01	115	14.98	108	14.94	101	14.99	113
	June 16		June 17		June 18		June 19		June 20		June 21	
4	14.95	104	14.91	94	14.89	90	14.90	92	14.87	86	15.05	129
8	14.94	101	14.91	94	14.89	90	14.88	88	14.87	86	15.12	150
N	14.93	99	14.90	92	14.88	88	14.88	88	14.87	86	15.08	137
4	14.93	99	14.90	92	14.88	88	14.87	86	14.91	94	15.07	135
8	14.93	99	14.89	90	14.89	90	14.87	86	14.93	99	15.05	129
12	14.92	97	14.89	90	14.82	97	14.87	86	14.92	97	15.03	123

Supplemental record.- May 19, 2 a.m., 15.48 ft., 248 sec.-ft.; June 8, 6 p.m., 15.23 ft., 178 sec.-ft.; June 15, 6 p.m., 14.92 ft., 97 sec.-ft., 10 p.m., 15.03 ft., 123 sec.-ft.; May 21, 10 p.m., 15.78 ft., 431 sec.-ft.

## Mill Creek at Walla Walla, Wash.

Location.- Lat. 46°04'40", long. 118°17'00", in NE¼ sec. 22, T. 7 N., R. 36 E., at bridge, 0.9 mile downstream from diversion dam and 1.0 mile east of Walla Walla.

Drainage area.- 90 square miles.

Gage-height record.- Water-stage recorder graph except for period June 19 to July 19, when there was no gage-height record.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 900 second-feet and extended to peak stage on basis of slope-area measurement. Gage heights used to hundredths. Shifting-control method used May 1 to July 31. Discharge for period of no gage-height record computed on basis of records for other stations in basin.

Maxima.- May-June 1948: Discharge, 978 second-feet 7 a.m. May 9 (gage height, 2.72 feet).

1941 to April 1948: Discharge, 2,760 second-feet Dec. 28, 1945 (gage height, 4.0 feet).

Remarks.- Some regulation at diversion dam, 0.9 mile above station where water is diverted into Yellowhawk and Garrison Creeks for flood control and irrigation. City of Walla Walla diverts water for municipal supply. Other small diversions above station for irrigation. Records subject to revision.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	142	98	13	11	440	74	5	21	302	75	3.9
2	133	101	10	12	353	63	4	22	514	60	3.9
3	138	112	14	13	558	63	4	23	430	45	3.9
4	156	112	12	14	420	72	3	24	310	35	1.8
5	160	128	7	15	310	58	2	25	257	27	1.8
6	160	115	4	16	271	55	4	26	215	20	2.8
7	166	120	3	17	243	38	3	27	210	14	1.8
8	337	124	7	18	204	20	4	28	160	23	12
9	954	120	6	19	278	10	3	29	104	19	12
10	591	98	5	20	302	25	2.8	30	98	16	9.8
								31	98		9.8
Monthly mean discharge, in second-feet.....									291	64.7	5.75
Runoff, in inches.....									3.72	0.80	0.07

## Blue Creek near Walla Walla, Wash.

Location.- Lat. 46°03'40", long. 118°07'50", in SE¼NW¼ sec. 25, T. 7 N., R. 37 E., 1 mile upstream from mouth and 10 miles east of Walla Walla. Datum of gage is at mean sea level, unadjusted.

Drainage area.- 17.0 square miles.

Gage-height record.- Water-stage recorder graph except periods June 3-16, June 18 to July 16.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 310 second-feet and extended to peak stage. Discharge for periods of no gage-height record computed on basis of records for nearby streams. Gage heights used to hundredths. Shifting-control method used May 11 to July 31.

Maxima.- May-June 1948: Discharge, 415 second-feet 4 p.m. May 22 (elevation, 1,742.65 feet).

1939 to April 1948: Discharge, 725 second-feet Dec. 28, 1945 (elevation, 1,743.35 feet).

Remarks.- No known diversion or regulation.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	35	24	6	11	105	9	1	21	67	9	1.2
2	33	22	6	12	81	8	1	22	266	26	1.1
3	32	21	5	13	91	8	1	23	218	22	1.4
4	31	17	5	14	83	7	1	24	146	16	1.6
5	29	15	6	15	56	7	1	25	95	13	1.2
6	28	15	5	16	44	6	1	26	72	11	1.2
7	26	17	5	17	34	4.9	1.0	27	57	9	1.5
8	40	18	4	18	31	4	1.0	28	46	8	2.6
9	156	15	3	19	53	5	1.1	29	37	7	1.8
10	172	12	2	20	60	6	1.2	30	32	7	1.5
								31	29		1.4
Monthly mean discharge, in second-feet.....									73.6	12.3	2.38
Runoff, in inches.....									4.99	0.81	0.16

Location.- Lat. 46°04'20", long. 118°16'55", in NW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 23, T. 7 N., R. 36 E., 0.8 mile downstream from diversion of Garrison Creek, 1 mile downstream from point of diversion from Mill Creek, and 1 mile east of Walla Walla.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 130 second-feet and extended to peak stage. Gage heights used to hundredths. Shifting-control method used July 22-30.

Maxima.— May-June 1948: Discharge, 250 second-feet 2 a.m. May 9 (gage height, 2.31 feet).

1941 to April 1948: Discharge not determined, occurred June 7, 1941 (gage height, 4.00 feet).

Remarks. - Yellowhawk Creek diverts water from Mill Creek which is subject to regulation at flood-control dam on Mill Creek. Many small diversions above station for irrigation.

[illegible]

Location.- Lat. 46°04'25", long. 118°17'10", in NE $\frac{1}{4}$  sec. 22, T. 7 N., R. 36 E., 30 feet downstream from county bridge. 0.8 mile downstream from Yellowhawk Creek diversion, and 0.9 mile east of Walla Walla.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Gage heights used to hundredths.

Maxima.— May-June 1948: Discharge, 60 second-feet 2 a.m. May 9 (gage height, 3.28 ft.).  
1941 to April 1948: Discharge, 58 second-feet Feb. 26, 1948 (gage height, 3.25 feet).

Remarks.- Regulation at Mill Creek flood-control dam, 0.8 mile upstream. Garrison Creek diverts some flood water from Mill Creek and water for irrigation during irrigation seasons.

[illegible]

## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

East Fork Touchet River near Dayton, Wash.

Location.- Lat. 46°16'45", long. 117°54'05". in NW¼ sec. 11, T. 9 N., R. 39 E., 250 feet upstream from city of Dayton's water-supply headworks, 1,000 feet upstream from Hatley Creek, three-quarters of a mile downstream from Wolf Creek, 3 miles upstream from confluence with South Fork, and 4 miles southeast of Dayton. Datum of gage is 1,768.3 feet above mean sea level (river-profile survey).

Drainage area.- 102 square miles.

Gage-height record.- Water-stage recorder graph except for July 23, 24, for which gage heights were interpolated.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 480 second-feet and extended to peak stage. Gage heights used to hundredths May 17 to June 21; hundredths below and half-tenths above 3.7 feet May 1-16, June 22 to July 31. Shifting-control method used May 1-8.

Maxima.- May-June 1948: Discharge, 820 second-feet 1 a.m. May 13 (gage height, 4.06 feet).

1941 to April 1948: Discharge, 1,380 second-feet Feb. 26, 1948 (gage height, 5.05 feet).

Remarks.- Small diversions above station for irrigation.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	77	334	84	11	454	198	75	21	515	118	66
2	58	314	82	12	477	185	71	22	494	121	63
3	64	302	81	13	640	172	68	23	474	112	66
4	48	288	82	14	580	163	68	24	465	107	61
5	36	270	84	15	482	159	66	25	456	101	56
6	38	250	84	16	442	155	66	26	519	99	56
7	41	235	81	17	446	142	64	27	519	92	69
8	104	225	77	18	412	136	64	28	489	88	110
9	283	216	73	19	483	127	70	29	444	86	77
10	459	208	73	20	494	124	68	30	394	84	63
								31	360		63
Monthly mean discharge, in second-feet .....									363	174	72.1
Runoff, in inches .....									4.10	1.90	0.82

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	3.28	442	3.23	422	3.57	575	3.38	486	3.47	526		
8	3.28	442	3.20	410	3.33	464	3.37	482	3.45	518		
N	3.33	464	3.18	402	3.50	450	3.35	472	3.42	504	3.40	495
4	3.29	446	3.17	398	3.35	472	3.36	477	3.43	508		
8	3.27	438	3.17	398	3.36	477	3.49	536	3.43	508		
12	3.25	430	3.30	450	3.38	486	3.50	540	3.42	504	3.37	482
	May 23		May 24		May 25		May 26		May 27		May 28	
4							3.51	545	3.44	513	3.40	495
8							3.47	526	3.45	518	3.38	486
N	3.35	472	3.33	464	3.30	450	3.40	495	3.38	486		
4					3.50	450	3.40	495	3.40	495		
8							3.47	526	3.50	540		
12	3.34	468	3.33	464	3.33	464	3.46	522	3.58	580	3.34	468
	May 29		May 30		May 31		June 1		June 2		June 3	
4												
8												
N	3.29	446										
4												
8												
12	3.21	414	3.11	374	3.04	346	2.98	322	2.94	307	2.91	296
	June 4		June 5		June 6		June 7		June 8		June 9	
4												
8												
N											2.68	217
4												
8												
12	2.87	281	2.81	260	2.75	240	2.72	230	2.69	220	2.66	211
	June 10		June 11		June 12		June 13		June 14		June 15	
4												
8												
N												
4												
8												
12	2.64	204	2.60	192	2.55	178	2.51	167	2.48	159	2.48	159
	June 16		June 17		June 18		June 19		June 20		June 21	
4					2.40	138						
8												
N					2.37	131	2.35	126				
4			2.40	138	2.40	138	2.33	121				
8												
12	2.45	151	2.40	138	2.39	136	2.35	126	2.33	121	2.30	114

Supplemental record.- May 17, 9 a.m., 3.33 ft., 464 sec.-ft.; May 18, 10 p.m., 3.25 ft., 430 sec.-ft.; May 19, 1 a.m., 3.30 ft., 450 sec.-ft., 2 a.m., 3.47 ft., 526 sec.-ft., 3 a.m., 3.67 ft., 625 sec.-ft., 6 a.m., 3.36 ft., 477 sec.-ft.; May 20, 6 p.m., 3.42 ft., 504 sec.-ft.; May 21, 2 a.m., 3.50 ft., 540 sec.-ft.; May 26, 1 a.m., 3.53 ft., 555 sec.-ft.; May 27, 6 p.m., 3.40 ft., 495 sec.-ft., 9 p.m., 3.60 ft., 590 sec.-ft.

## Touchet River near Touchet, Wash.

Location.- Lat. 46°05'25", long. 118°39'40", in NE $\frac{1}{4}$  sec. 15, T. 7 N., R. 33 E., 100 feet downstream from county road bridge, 3 $\frac{1}{2}$  miles north of Touchet, and 4 $\frac{1}{2}$  miles upstream from mouth.

Drainage area.- 726 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 4,500 second-feet and extended to peak stage on basis of slope-area measurements. Gage heights used to half tenths between 4.0 and 6.0 feet; hundredths below and tenths above these limits.

Maxima.- May-June 1948: Discharge, 2,510 second-feet noon May 9 (gage height, 7.51 feet).

1941 to April 1948: Discharge, 4,850 second-feet Feb. 26, 1948 (gage height, 10.07 feet).

Remarks.- Many large diversions above station for irrigation. No regulation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	540	540	98	11	1,470	313	77	21	960	209	74
2	500	500	89	12	1,240	301	76	22	1,060	216	63
3	492	468	86	13	1,510	286	76	23	1,010	195	58
4	669	439	84	14	1,470	272	71	24	910	177	55
5	580	411	89	15	1,180	263	67	25	835	158	55
6	560	380	108	16	985	337	63	26	810	148	54
7	648	355	90	17	885	261	60	27	785	139	51
8	781	337	95	18	835	224	59	28	1,010	130	61
9	1,870	328	90	19	1,200	283	67	29	760	120	113
10	1,870	319	84	20	1,110	212	92	30	648	111	85
								31	580		68
Monthly mean discharge, in second-feet .....									960	281	76.1
Runoff, in inches .....									1.52	0.43	0.12

## Umatilla River Basin

Umatilla River above Meacham Creek, near Gibbon, Oreg.

**Location.**- Lat.  $45^{\circ}43'$ , long.  $118^{\circ}20'$ , in SW $\frac{1}{4}$  sec. 21, T. 3 N., R. 36 E., 0.8 mile downstream from Ryan Creek,  $2\frac{1}{2}$  miles upstream from Meacham Creek, and  $2\frac{1}{2}$  miles northeast of Gibbon. Datum of gage is 1,865.25 feet above mean sea level, datum of 1929.

**Drainage area.**- 125 square miles.

**Gage-height record.**- Water-stage recorder graph.

**Discharge record.**- Rating curve defined by current-meter measurements below 1,950 second-feet and extended to peak stage by logarithmic plotting.

**Maxima.**- May-June 1948: Discharge, 3,380 second-feet 1 p.m. May 22 (gage height, 6.88 feet).

1933 to April 1948: Discharge, 6,660 second-feet Dec. 12, 1946 (gage height, 8.84 feet).

**Remarks.**- No diversion or regulation above station.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	468	685	219	11	1,050	461	114	21	1,220	796	81
2	432	694	198	12	1,000	413	108	22	2,720	656	78
3	516	696	180	13	1,400	417	100	23	2,140	520	76
4	752	629	166	14	1,200	384	97	24	1,630	440	72
5	680	574	172	15	1,030	351	94	25	1,430	388	70
6	758	568	153	16	1,100	345	91	26	1,370	340	67
7	935	577	156	17	1,110	314	88	27	1,340	302	70
8	1,230	588	133	18	922	293	89	28	1,190	274	103
9	1,720	570	124	19	1,130	306	88	29	839	255	85
10	1,210	509	114	20	1,210	311	86	30	700	246	74
								31	732		67
Monthly mean discharge, in second-feet									1,134	463	110
Runoff, in inches									10.46	4.14	1.02

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height		Discharge		Gage height		Discharge		Gage height		Discharge		Gage height		Discharge		Gage height		Discharge	
	May 17		May 18		May 19		May 20		May 21		May 22		May 23		May 24		May 25		May 26	
4			4.50	970	4.67	1,090	4.85	1,220	4.92	1,280	5.70	1,980			5.50	1,780	5.14	1,450	5.03	1,360
8			4.46	942	4.72	1,120	4.78	1,170	4.84	1,210	6.44	2,820			5.32	1,610	5.05	1,380	4.94	1,290
N	4.69	1,100	4.41	907	4.72	1,120	4.72	1,120	4.79	1,170	6.81	3,220			5.17	1,480	4.98	1,320	4.86	1,230
4			4.36	872	4.76	1,150	4.72	1,120	4.76	1,150	6.72	3,170			5.24	1,540	5.06	1,390	5.01	1,350
8			4.33	851	4.81	1,190	5.00	1,340	4.79	1,170	6.59	3,000			5.39	1,670	5.27	1,560	5.23	1,530
12	4.54	998	4.52	984	4.87	1,240	5.01	1,350	5.02	1,360	6.36	2,720			5.28	1,570	5.14	1,450	5.13	1,440
May 28																				
4	6.09	2,410	5.50	1,780	5.14	1,450	5.03	1,360	4.98	1,320					5.50	1,780	5.14	1,450	5.03	1,360
8	5.94	2,240	5.32	1,610	5.05	1,380	4.94	1,290	4.93	1,280	4.89	1,250			5.32	1,610	5.05	1,380	4.94	1,290
N	5.70	1,980	5.17	1,480	4.98	1,320	4.86	1,230	4.80	1,180					5.17	1,480	4.98	1,320	4.86	1,230
4	5.65	1,930	5.24	1,540	5.06	1,390	5.01	1,350	4.91	1,270	4.68	1,100			5.24	1,540	5.06	1,390	5.01	1,350
8	5.73	2,010	5.39	1,670	5.27	1,560	5.23	1,530	5.15	1,460					5.39	1,670	5.27	1,560	5.23	1,530
12	5.58	1,860	5.28	1,570	5.14	1,450	5.13	1,440	5.17	1,480	4.52	984			5.28	1,570	5.14	1,450	5.13	1,440
May 29																				
4	4.46	942	4.11	716	4.21	776	4.07	692	4.07	692	4.11	716			4.11	716	4.21	776	4.07	692
8	4.35	865	4.06	686	4.13	728	4.03	668	4.03	668	4.07	692			4.06	686	4.13	728	4.03	668
N	4.27	812	4.01	656	4.08	698	4.00	650	4.00	650	4.06	686			4.01	656	4.08	698	4.00	650
4	4.21	776	4.00	650	4.06	686	4.00	650	4.02	662	4.05	680			4.00	650	4.06	686	4.00	650
8	4.20	770	4.08	698	4.13	728	4.13	728	4.18	758	4.07	692			4.08	698	4.13	728	4.13	728
12	4.17	752	4.31	837	4.12	722	4.12	722	4.17	752	4.06	686			4.31	837	4.12	722	4.12	722
June 1																				
4	4.02	662	3.87	585	3.83	565	3.87	585	3.88	590	3.88	590			3.87	585	3.83	565	3.87	585
8	3.98	640	3.83	565	3.80	550	3.83	565	3.84	570	3.83	565			3.83	565	3.80	550	3.83	565
N	3.93	615	3.80	550	3.77	535	3.80	550	3.81	555	3.79	545			3.80	550	3.77	535	3.80	550
4	3.91	605	3.81	555	3.82	560	3.84	570	3.79	545	3.80	550			3.81	555	3.82	560	3.84	570
8	3.92	610	3.88	590	3.92	610	3.89	595	4.01	656	3.85	575			3.88	590	3.92	610	3.89	595
12	3.90	600	3.89	595	3.89	595	3.90	600	3.95	625	3.83	565			3.89	595	3.89	595	3.90	600
June 2																				
4	3.78	540	3.64	476	3.53	432	3.55	440			3.37	368			3.64	476	3.53	432	3.55	440
8	3.73	515	3.61	464	3.49	416	3.49	416	3.42	388	3.34	356			3.61	464	3.49	416	3.49	416
N	3.69	496	3.59	456	3.45	400	3.47	408			3.31	344			3.59	456	3.45	400	3.47	408
4	3.65	480	3.56	444	3.43	392	3.45	400	3.37	368	3.28	333			3.56	444	3.43	392	3.45	400
8	3.69	496	3.59	456	3.44	396	3.48	412			3.29	336			3.59	456	3.44	396	3.48	412
12	3.67	488	3.58	452	3.52	428	3.50	420	3.38	372	3.37	368			3.58	452	3.52	428	3.50	420
June 3																				
4	3.33	352	3.27	330	3.18	298	3.27	330	3.15	288	3.91	605			3.27	330	3.18	298	3.27	330
8	3.31	344	3.24	319	3.16	291	3.22	312	3.12	277	4.57	1,020			3.24	319	3.16	291	3.22	312
N	3.29	336	3.21	308	3.15	288	3.18	298	3.14	284	4.43	921			3.21	308	3.15	288	3.18	298
4	3.31	344	3.19	302	3.14	284	3.16	291	3.24	319	4.33	851			3.19	302	3.14	284	3.16	291
8	3.31	344	3.19	302	3.14	284	3.17	294	3.36	364	4.26	806			3.19	302	3.14	284	3.17	294
12	3.29	336	3.20	305	3.23	316	3.16	291	3.40	380	4.19	764			3.20	305	3.23	316	3.16	291

**Supplemental record.**- May 22, 1 p.m., 6.88 ft., 3,380 sec.-ft.; May 23, 2 p.m., 5.60 ft., 1,880 sec.-ft.; May 24, 2 p.m., 5.14 ft., 1,450 sec.-ft.; May 25, 1 p.m., 4.94 ft., 1,290 sec.-ft.; May 27, 9 p.m., 5.26 ft., 1,550 sec.-ft.; June 19, 2 a.m., 3.30 ft., 340 sec.-ft.

## Umatilla River at Pendleton, Oreg.

Location.- Lat. 45°40', long. 118°48', in NE $\frac{1}{4}$  sec. 10, T. 2 N., R. 32 E., at Pendleton, 2 $\frac{1}{2}$  miles upstream from McKay Creek. Datum of gage is 1,082.54 feet above mean sea level, datum of 1929.

Drainage area.- 637 square miles.

Gage-height record.- Water-stage recorder graph except period 11 a.m. May 23 to 9 a.m.

May 24, when there was no gage-height record.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 3,500 second-feet and extended to peak stage. Gage heights used to hundredths.

Discharge for period of no gage-height record computed on basis of gage-height graph based on recorded range in stage.

Maxima.- May-June 1948: Discharge, 6,970 second-feet 8 to 10 p.m. May 22 (gage height, 5.70 feet).

1891-92, 1903-5, 1921 to April 1948: Discharge, 13,700 second-feet Dec. 12, 1946 (gage height, 8.45 feet).

Flood of May 30-31, 1906, reached a stage of 11.0 feet (discharge, 15,500 second-feet, estimated by Corps of Engineers).

Maximum flood known, 17,000 second-feet Dec. 14, 1882 (furnished by Corps of Engineers).

Remarks.- Small diversion above station for irrigation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,330	1,230	306	11	2,890	748	158	21	2,600	855	91
2	1,240	1,180	266	12	2,350	680	152	22	5,050	990	84
3	1,240	1,150	238	13	3,120	658	137	23	4,990	818	79
4	1,860	1,080	221	14	3,080	611	125	24	3,580	690	77
5	1,860	984	338	15	2,640	563	120	25	2,750	600	77
6	1,790	935	263	16	2,520	748	112	26	2,460	540	73
7	2,230	923	228	17	2,530	513	104	27	2,300	485	71
8	2,530	903	211	18	2,060	464	101	28	2,150	431	84
9	4,150	908	189	19	2,420	483	99	29	1,640	377	109
10	3,640	822	172	20	2,610	483	99	30	1,320	334	89
								31	1,350		77
Monthly mean discharge, in second-feet .....									2,519	740	147
Runoff, in inches .....									4.56	1.30	0.27

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
May 17			May 18		May 19		May 20		May 21		May 22	
4	3.73	2,730	3.35	2,180	3.50	2,380	3.77	2,790	3.70	2,680	3.63	2,580
8	3.68	2,650	3.26	2,060	3.50	2,380	3.72	2,710	3.72	2,710	4.40	3,960
N	3.67	2,640	3.26	2,060	3.58	2,500	3.67	2,640	3.64	2,590	5.28	5,940
4	3.59	2,520	3.22	2,010	3.56	2,470	3.60	2,530	3.62	2,560	5.40	6,230
8	3.42	2,270	3.16	1,930	3.56	2,470	3.54	2,440	3.58	2,500	5.68	6,920
12	3.40	2,240	3.18	1,960	3.66	2,620	3.58	2,500	3.55	2,460	5.65	6,840
May 23			May 24		May 25		May 26		May 27		May 28	
4	5.54	5,770	4.72	3,830	4.33	3,050	4.12	2,660	3.99	2,430	4.00	2,450
8	5.36	5,320	4.65	3,680	4.23	2,860	4.03	2,500	3.90	2,290	3.88	2,260
N	5.13	4,760	4.49	3,360	4.13	2,670	3.96	2,390	3.86	2,230	3.80	2,140
4	4.98	4,410	4.33	3,050	4.08	2,590	3.91	2,310	3.85	2,220	3.71	2,010
8	4.90	4,230	4.22	2,840	4.02	2,480	3.90	2,290	3.83	2,180	3.65	1,940
12	4.80	4,010	4.31	3,010	4.13	2,670	4.03	2,500	3.94	2,350	3.59	1,860
May 29			May 30		May 31		June 1		June 2		June 3	
4			3.16	1,390	3.25	1,480	3.06	1,290	3.00	1,240	2.99	1,230
8			3.13	1,360	3.19	1,420	3.03	1,270	2.97	1,210	2.96	1,200
N	3.39	1,630	3.08	1,310	3.13	1,360	3.00	1,240	2.93	1,180	2.90	1,150
4			3.02	1,260	3.06	1,290	2.96	1,200	2.88	1,130	2.85	1,110
8			2.98	1,220	3.01	1,250	2.91	1,160	2.84	1,100	2.82	1,090
12	3.19	1,420	3.07	1,300	3.03	1,270	2.95	1,200	2.93	1,180	2.84	1,100
June 4			June 5		June 6		June 7		June 8		June 9	
4	2.84	1,100	2.75	1,030	2.67	969	2.64	948	2.62	934	2.66	962
8	2.82	1,090	2.72	1,010	2.65	955	2.64	948	2.62	934	2.66	962
N	2.84	1,100	2.69	983	2.63	941	2.61	927	2.59	913	2.59	913
4	2.81	1,080	2.66	982	2.59	913	2.58	906	2.55	885	2.54	878
8	2.77	1,050	2.62	934	2.57	899	2.56	892	2.52	864	2.50	850
12	2.75	1,030	2.63	941	2.61	927	2.58	906	2.57	899	2.52	864
June 10			June 11		June 12		June 13		June 14		June 15	
4	2.52	864	2.38	772	2.28	708	2.18	648	2.17	642	2.05	572
8	2.50	850	2.36	759	2.27	702	2.25	690	2.16	636	2.04	567
N	2.47	830	2.34	746	2.24	684	2.23	678	2.13	618	2.03	562
4	2.42	798	2.34	746	2.20	660	2.19	654	2.09	594	2.01	550
8	2.38	772	2.31	726	2.19	654	2.17	642	2.05	572	1.98	534
12	2.39	778	2.27	702	2.17	642	2.16	636	2.05	572	2.12	612
June 16			June 17		June 18		June 19		June 20		June 21	
4	3.10	1,330					1.86	470	1.82	450	1.98	534
8	2.45	818					1.94	512	1.83	455	2.45	818
N	2.14	624	1.95	518	1.85	465	1.93	506	1.86	470	2.52	864
4	2.07	584					1.89	485	1.85	465	2.84	1,100
8	2.02	556					1.86	470	2.04	567	2.83	1,090
12	2.00	545	1.86	470	1.83	455	1.83	455	1.97	528	2.81	1,080

Supplemental record.- May 19, 3 a.m., 3.60 ft., 2,550 sec.-ft., 6 a.m., 3.45 ft., 2,310 sec.-ft., 1 p.m., 3.50 ft., 2,380 sec.-ft., 3 p.m., 3.57 ft., 2,480 sec.-ft.; May 21, 6 a.m., 3.79 ft., 2,820 sec.-ft.; June 21, 7 a.m., 2.03 ft., 562 sec.-ft., 8:30 a.m., 2.55 ft., 885 sec.-ft., 11 a.m., 2.32 ft., 733 sec.-ft., 2 p.m., 2.79 ft., 1,060 sec.-ft.



## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

Umatilla River at Yoakum, Oreg.

Location.- Lat. 45°41', long. 119°02', in SW $\frac{1}{4}$  sec. 2, T. 2 N., R. 30 E., at highway bridge, half a mile northeast of Yoakum station and 2 $\frac{1}{2}$  miles downstream from abandoned Furnish Reservoir. Datum of gage is 770.41 feet above mean sea level, datum of 1929.

Drainage area.- 1,280 square miles.

Gage-height record.- Water-stage recorder graph except period June 28 to 9 a.m. June 30, when there was no gage-height record.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 4,000 second-feet and extended to peak stage. Discharge for period of no gage-height record computed on basis of interpolated gage heights.

Maxima.- May-June 1948: Discharge, 6,430 second-feet 11 p.m. May 22 (gage height, 7.02 feet).

1903 to April 1948: Discharge, 20,000 second-feet May 30, 1906 (gage height, 15.0 feet, datum then in use, from floodmarks), from rating curve extended above 6,000 second-feet on basis of records for station near Umatilla.

Remarks.- Many diversions above station for irrigation. Flow regulated by McKay Reservoir; outlet gates regulated May 3, 8, 10-15, 20, 21, June, 2, 5, 7, 13, July 2, 3, 12, 15, 19, 25, 30.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,810	1,880	343	11	4,390	855	402	21	3,650	908	366
2	1,650	1,810	308	12	3,970	797	414	22	4,920	1,180	362
3	1,640	1,640	326	13	4,560	780	362	23	5,650	958	362
4	2,420	1,520	430	14	4,910	710	340	24	4,400	790	382
5	2,460	1,350	387	15	3,970	630	336	25	3,820	680	382
6	2,430	1,260	502	16	3,640	975	350	26	3,520	596	390
7	2,980	1,220	462	17	3,670	638	354	27	3,340	551	382
8	3,270	1,030	462	18	3,350	571	350	28	3,160	488	386
9	4,800	1,010	446	19	3,600	562	350	29	2,500	430	416
10	4,420	931	422	20	3,810	552	366	30	2,060	374	404
								31	2,040		398
Monthly mean discharge, in second-feet .....									3,445	923	385
Runoff, in inches .....									3.10	0.80	0.35

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4			4.90	3,460	4.81	3,350	5.25	3,900	5.10	3,700	4.98	3,560
8	5.18	3,800	4.87	3,420	5.05	3,640	5.34	4,010	5.20	3,830	5.20	3,830
N			4.84	3,390	5.04	3,630	5.32	3,990	5.16	3,780	5.95	4,840
4	5.08	3,680	4.76	3,290	5.10	3,700	5.12	3,730	5.00	3,580	6.76	6,040
8			4.70	3,220	5.11	3,710	5.02	3,600	4.96	3,530	6.91	6,260
12	4.93	3,500	4.64	3,150	5.12	3,730	4.96	3,530	4.96	3,530	7.00	6,400
	May 23		May 24		May 25		May 26		May 27		May 28	
4	6.93	6,300	5.92	4,800	5.40	4,090	5.11	3,710	4.95	3,520	4.82	3,360
8	6.79	6,080	5.82	4,660	5.35	4,020	5.10	3,700	4.94	3,510	4.85	3,400
N	6.54	5,710	5.67	4,450	5.22	3,860	4.98	3,560	4.84	3,390	4.74	3,270
4	6.28	5,320	5.48	4,190	5.08	3,680	4.88	3,440	4.74	3,270	4.57	3,080
8	6.02	4,940	5.32	3,990	4.96	3,530	4.77	3,300	4.64	3,150	4.43	2,920
12	5.87	4,730	5.25	3,900	4.96	3,530	4.79	3,330	4.62	3,130	4.31	2,790
	May 29		May 30		May 31		June 1		June 2		June 3	
4			3.68	2,150	3.53	2,020	3.44	1,940	3.34	1,850	3.14	1,670
8	4.12	2,590	3.65	2,120	3.72	2,190	3.43	1,930	3.38	1,880	3.18	1,700
N			3.59	2,070	3.63	2,110	3.40	1,900	3.35	1,860	3.13	1,660
4	3.94	2,410	3.51	2,000	3.54	2,030	3.37	1,870	3.28	1,790	3.07	1,620
8			3.44	1,940	3.46	1,950	3.30	1,810	3.22	1,740	3.02	1,580
12	3.74	2,210	3.46	1,950	3.41	1,910	3.26	1,770	3.15	1,680	2.99	1,550
	June 4		June 5		June 6		June 7		June 8		June 9	
4	3.00	1,560	2.82	1,420	2.64	1,270	2.60	1,240	2.33	1,050	2.27	1,010
8	3.00	1,580	2.82	1,420	2.68	1,300	2.62	1,260	2.35	1,060	2.35	1,060
N	2.97	1,540	2.66	1,290	2.65	1,280	2.61	1,250	2.35	1,060	2.34	1,060
4	2.93	1,500	2.70	1,320	2.61	1,250	2.58	1,230	2.30	1,030	2.27	1,010
8	2.88	1,460	2.66	1,290	2.56	1,210	2.53	1,190	2.24	994	2.19	964
12	2.83	1,420	2.62	1,260	2.54	1,200	2.33	1,050	2.21	976	2.16	946
	June 10		June 11		June 12		June 13		June 14		June 15	
4	2.17	952	2.02	862	1.88	790	1.84	770	1.74	720	1.57	636
8	2.18	958	2.02	862	1.91	805	1.83	765	1.72	710	1.57	636
N	2.17	952	2.00	850	1.90	800	1.88	790	1.73	715	1.57	636
4	2.13	928	1.97	835	1.87	785	1.91	805	1.71	705	1.54	623
8	2.07	892	2.04	874	1.86	780	1.85	775	1.70	700	1.51	610
12	2.02	862	1.97	835	1.91	805	1.80	750	1.65	675	1.49	600
	June 16		June 17		June 18		June 19		June 20		June 21	
4	1.78	740									1.60	650
8	3.12	1,660	1.60	650	1.42	569	1.39	556	1.38	551	1.58	641
N	2.28	1,020									2.16	946
4	1.87	785	1.57	636	1.42	569	1.42	569	1.38	551	2.36	1,070
8	1.72	710									2.66	1,290
12	1.63	665	1.47	592	1.40	560	1.40	560	1.38	551	2.67	1,300

Supplemental record.- May 19, 6 a.m., 5.12 ft., 3,730 sec.-ft.; May 21, 2 p.m., 5.09 ft., 3,690 sec.-ft., 3 p.m., 4.90 ft., 3,460 sec.-ft.; May 22, 11 p.m., 7.02 ft., 6,430 sec.-ft.; June 3, 1 a.m., 3.08 ft., 1,620 sec.-ft.; June 5, 11 a.m., 2.80 ft., 1,400 sec.-ft., 1 p.m., 2.55 ft., 1,200 sec.-ft., 3 p.m., 2.72 ft., 1,340 sec.-ft.; June 7, 10 p.m., 2.10 ft., 1,170 sec.-ft.; June 8, 2 a.m., 2.31 ft., 1,040 sec.-ft.; June 16, 2:30 a.m., 2.00 ft., 850 sec.-ft., 5 a.m., 2.96 ft., 1,530 sec.-ft., 8 a.m., 2.82 ft., 1,420 sec.-ft.; June 21, 2 a.m., 1.63 ft., 665 sec.-ft., 11 a.m., 1.62 ft., 660 sec.-ft.,

## Umatilla River near Umatilla, Oreg.

**Location.**— Lat. 45°54', long. 119°20', in NW¼ sec. 21, T. 5 N., R. 28 E., 1½ miles downstream from West Division main canal of Umatilla project and 2 miles upstream from Umatilla and mouth of river. Datum of gage is 330.57 feet above mean sea level, datum of 1929.

**Drainage area.**— 2,290 square miles.

**Gage-height record.**— Water-stage recorder graph.

**Discharge record.**— Stage-discharge relation defined by current-meter measurements below 6,000 second-feet. Gage heights used to hundredths.

**Maxima.**— May-June 1948: Discharge, 6,080 second-feet 8 p.m. May 23 (gage height, 6.26 feet).

1903 to April 1948: Discharge observed, 19,600 second-feet May 31, 1906 (gage height, 11.0 feet).

**Remarks.**— Many diversions above station for irrigation; Brownell Canal diverts below station. Flow regulated by McKay and Cold Springs Reservoirs.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,440	1,530	11	11	4,450	686	69	21	3,760	324	11
2	1,330	1,280	12	12	4,560	533	85	22	3,780	857	25
3	1,250	1,130	12	13	4,280	577	61	23	5,670	710	17
4	1,800	1,010	11	14	5,080	526	26	24	4,720	478	15
5	2,300	893	14	15	4,660	418	14	25	4,050	306	18
6	2,160	764	186	16	3,900	612	13	26	3,510	174	14
7	2,560	692	130	17	3,870	482	11	27	3,220	72	14
8	3,050	567	110	18	3,700	356	11	28	3,030	55	23
9	3,950	456	107	19	3,570	282	11	29	2,370	15	25
10	4,840	674	102	20	3,940	276	11	30	1,850	13	65
								31	1,660		44
Monthly mean discharge, in second-feet									3,365	557	4.12
Runoff, in inches									1.69	0.27	0.02

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	5.39	3,830	5.38	3,800	5.24	3,470	5.38	3,800	5.35	3,730	5.29	3,590
8	5.37	3,780	5.34	3,710	5.22	3,420	5.38	3,800	5.31	3,630	5.27	3,540
N	5.37	3,780	5.33	3,680	5.24	3,470	5.44	3,950	5.34	3,710	5.28	3,560
4	5.43	3,920	5.31	3,630	5.34	3,710	5.50	4,100	5.40	3,850	5.35	3,730
8	5.45	3,980	5.30	3,610	5.33	3,680	5.52	4,150	5.40	3,850	5.52	4,150
12	5.44	3,950	5.28	3,560	5.37	3,780	5.44	3,950	5.31	3,630	5.68	4,560
	May 23		May 24		May 25		May 26		May 27		May 28	
4	5.90	5,130	5.97	5,130	5.53	4,180	5.26	3,510	5.11	3,160	5.05	3,020
8	6.13	5,730	5.70	4,610	5.47	4,020	5.24	3,470	5.12	3,190	5.05	3,020
N	6.21	5,950	5.66	4,510	5.49	4,080	5.29	3,590	5.17	3,300	5.09	3,120
4	6.22	5,970	5.64	4,450	5.48	4,050	5.29	3,590	5.16	3,280	5.09	3,120
8	6.26	6,080	5.60	4,350	5.43	3,920	5.22	3,420	5.13	3,210	5.03	2,980
12	6.15	5,780	5.62	4,400	5.34	3,710	5.16	3,280	5.08	3,090	4.95	2,800
	May 29		May 30		May 31		June 1		June 2		June 3	
4	4.87	2,630	4.54	1,970	4.36	1,640	4.31	1,560	4.14	1,310	4.06	1,200
8	4.80	2,480	4.50	1,890	4.36	1,640	4.37	1,660	4.13	1,290	4.03	1,160
N	4.74	2,360	4.48	1,850	4.36	1,640	4.35	1,620	4.12	1,280	3.98	1,100
4	4.67	2,220	4.45	1,800	4.41	1,730	4.27	1,500	4.13	1,290	3.98	1,100
8	4.58	2,120	4.37	1,750	4.38	1,680	4.18	1,360	4.11	1,260	3.95	1,060
12	4.58	2,040	4.37	1,660	4.34	1,610	4.15	1,320	4.08	1,220	3.95	1,060
	June 4		June 5		June 6		June 7		June 8		June 9	
4	3.93	1,040	3.84	934	3.71	791	3.64	720	3.56	644	3.36	478
8	3.92	1,020	3.83	923	3.70	780	3.63	710	3.53	617	3.33	454
N	3.89	989	3.80	890	3.67	750	3.61	690	3.45	550	3.28	416
4	3.90	1,000	3.80	890	3.67	750	3.60	680	3.41	518	3.30	430
8	3.88	978	3.76	846	3.67	750	3.58	662	3.39	502	3.35	470
12	3.86	956	3.71	791	3.65	730	3.56	644	3.38	494	3.37	486
	June 10		June 11		June 12		June 13		June 14		June 15	
4	3.59	671	3.65	730	3.36	478	3.47	566	3.49	582	3.33	454
8	3.57	653	3.63	710	3.43	534	3.49	582	3.46	558	3.32	446
N	3.51	599	3.62	700	3.38	494	3.52	608	3.45	550	3.30	430
4	3.68	760	3.61	690	3.48	574	3.48	574	3.36	478	3.25	395
8	3.67	750	3.59	671	3.50	590	3.46	558	3.35	470	3.22	374
12	3.66	740	3.37	486	3.48	574	3.48	574	3.34	462	3.19	354
	June 16		June 17		June 18		June 19		June 20		June 21	
4	3.18	348	3.44	542	3.22	374	3.09	294	3.09	294	3.04	266
8	3.20	360	3.37	486	3.20	360	3.09	294	3.07	283	3.06	278
N	3.17	342	3.32	446	3.17	342	3.07	283	3.06	278	3.13	318
4	4.06	1,200	3.30	430	3.11	306	3.07	283	3.04	266	3.15	330
8	3.83	923	3.34	462	3.08	289	3.02	255	3.03	261	3.14	324
12	3.56	644	3.27	409	3.08	289	3.07	283	3.03	261	3.51	599

## McKay Creek near Pilot Rock, Oreg.

Location.- Lat. 45°33', long. 118°46', in NE $\frac{1}{4}$  sec. 23, T. 1 N., R. 32 E., 400 feet downstream from county road bridge, three-quarters of a mile upstream from maximum flow line (altitude, 1,322 feet) of McKay Reservoir, and 6 miles northeast of Pilot Rock. Datum of gage is 1,335.85 feet above mean sea level, datum of 1929.

Drainage area.- 178 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Shifting-control method used July 24-31.

Maxima.- May-June 1948: Discharge, 1,140 second-feet 5:30 a.m. May 13 (gage height, 4.35 feet).

1921, 1926 to April 1948: Discharge, 6,000 second-feet Apr. 1, 1931 (gage height, 10.4 feet, site and datum then in use).

Remarks.- Many small diversions above station for irrigation.

## Mean discharge, in second-feet, 1948

mean discharge, in second-feet, 1940												
Day	May	June	July	Day	May	June	July	Day	May	June	July	
1	334	171	26	11	926	56	12	21	494	162	5.8	
2	326	148	24	12	816	53	11	22	523	174	5.8	
3	326	129	24	13	980	55	10	23	495	142	5.4	
4	373	119	24	14	858	50	10	24	418	116	5.4	
5	342	107	29	15	684	47	9.5	25	353	97	5.4	
6	382	93	27	16	580	89	8.2	26	300	73	5.4	
7	500	80	18	17	503	69	7.8	27	259	68	5.4	
8	574	69	17	18	465	58	6.6	28	233	50	5.0	
9	891	60	15	19	542	56	6.6	29	203	38	5.0	
10	940	56	12	20	527	56	6.2	30	174	33	5.0	
								31	174		5.0	
Monthly mean discharge, in second-feet.....										500	85.8	11.7
Runoff, in inches .....										3.24	0.54	0.08

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4			3.32	500	3.46	570					3.27	476
8	3.35	515	3.26	472	3.46	570	3.39	535	3.33	505	3.35	515
N			3.22	454	3.41	545					3.47	575
4	3.30	490	3.19	440	3.37	525	3.35	515	3.29	486	3.40	540
8			3.18	436	3.38	530					3.38	530
12	3.25	468	3.27	476	3.42	550	3.34	510	3.26	472	3.38	530
	May 23		May 24		May 25		May 26		May 27		May 28	
4									2.79	273		
8	3.35	515	3.18	436	3.03	368	2.90	313	2.78	269	2.69	240
N									2.75	260		
4	3.27	476	3.10	400	2.96	338	2.83	287	2.72	250	2.65	228
8									2.69	240		
12	3.23	458	3.05	378	2.93	326	2.79	273	2.71	246	2.61	217
	May 29		May 30		May 31		June 1		June 2		June 3	
4			2.49	184	2.51	190	2.51	190				
8	2.58	209	2.47	180	2.49	184	2.49	184	2.36	153	2.27	134
N			2.45	174	2.45	174	2.44	172				
4	2.54	198	2.41	164	2.42	167	2.41	164	2.33	147	2.22	124
8			2.40	162	2.39	160	2.38	158				
12	2.50	187	2.45	174	2.41	164	2.36	153	2.28	136	2.20	120
	June 4		June 5		June 6		June 7		June 8		June 9	
4												
8	2.22	124	2.15	110	2.08	97	2.01	85	1.93	71	1.88	63
N												
4	2.18	116	2.12	105	2.05	92	1.97	78	1.91	68	1.85	58
8												
12	2.17	114	2.08	97	2.01	85	1.93	71	1.88	63	1.84	57
	June 10		June 11		June 12		June 13		June 14		June 15	
4			1.82	54	1.82	54	1.79	50			1.75	44
8	1.85	58	1.82	54	1.82	54	1.80	51	1.82	54	1.74	43
N			1.82	54	1.80	51	1.82	54			1.74	43
4	1.83	56	1.83	56	1.78	48	1.81	51	1.78	48	1.73	42
8			1.82	54	1.79	73	1.84	57			1.72	41
12	1.82	54	1.83	56	1.94	50	1.81	52	1.75	44	2.16	112
	June 16		June 17		June 18		June 19		June 20		June 21	
4	1.98	80									2.01	85
8	2.10	101	1.93	71	1.85	58	1.85	58	1.80	51	2.14	109
N	2.04	90									2.60	214
4	2.03	88	1.90	66	1.85	58	1.83	56	1.82	54	2.57	206
8	2.00	83									2.54	198
12	1.97	78	1.86	60	1.85	58	1.80	51	1.95	74	2.52	192

Supplemental record.- May 18, 10 p.m., 3.29 ft., 486 sec.-ft.; June 11, 2 p.m., 1.91 ft., 88 sec.-ft.; June 12, 7 p.m., 1.78 ft., 48 sec.-ft., 9 p.m., 1.85 ft., 56 sec.-ft.; June 13, 5:30 p.m., 2.00 ft., 63 sec.-ft.; June 15, 10 p.m., 1.71 ft., 39 sec.-ft., 11:30 p.m., 2.24 ft., 128 sec.-ft.; June 16, 1 a.m., 1.90 ft., 66 sec.-ft., 2 a.m., 2.17 ft., 114 sec.-ft.; June 21, 10 a.m., 2.62 ft., 220 sec.-ft.

## McKay Creek near Pendleton, Oreg.

Location.- Lat. 45°37', long. 118°48', in sec. 34, T. 2 N., R. 32 E., just upstream from irrigation diversion dam, a quarter of a mile downstream from McKay Dam, and 4 miles south of Pendleton.

Drainage area.- 236 square miles.

Gage-height record.- Water-stage recorder graph except periods 2 a.m. May 11 to 10 a.m. May 12, 9 a.m. May 13 to 10 a.m. May 15, for which graph was reconstructed on basis of daily gage readings, two discharge measurements, and records for McKay Creek near Pilot Rock and Umatilla River at Yoakum.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge observed, 1,270 second-feet 2 to 3 p.m. May 13 (gage height, 2.68 feet).

1918 to April 1948: Discharge observed, 3,250 second-feet Feb. 10, 1921 (gage height, 4.4 feet, site and datum then in use), from rating curve extended above 1,200 second-feet.

Remarks.- Diversions above station for irrigation. Flow completely regulated since 1927 by McKay Reservoir. Maximum elevation McKay Reservoir during flood period, 1,321.9 feet probably on May 13 (contents, 73,550 acre-feet), from floodmarks.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	251	458	15	11	1,000	78	233	21	440	19	283
2	251	434	55	12	900	78	249	22	464	19	283
3	330	288	109	13	1,100	70	218	23	464	18	283
4	404	288	230	14	1,100	17	218	24	464	16	279
5	404	261	230	15	800	17	241	25	470	15	301
6	404	270	226	16	696	17	254	26	470	15	320
7	404	230	230	17	696	18	254	27	470	15	320
8	479	80	233	18	689	18	254	28	464	15	320
9	550	78	233	19	682	18	266	29	464	15	320
10	612	78	233	20	544	18	283	30	458	14	329
								31	458		344
Monthly mean discharge, in second-feet .....									561	99.2	247
Runoff, in inches .....									2.74	0.47	1.20

## Birch Creek at Rieth, Oreg.

Location.- Lat. 45°39', long. 118°53', in SE¼ sec. 13, T. 2 N., R. 31 E., a quarter of a mile upstream from mouth and half a mile southwest of Rieth.

Drainage area.- 291 square miles.

Gage height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge, 760 second-feet 8 a.m. May 14 (gage height, 4.70 feet).

1921-23, 1927 to April 1948: Discharge, 1,640 second-feet Jan. 29, 1928 (gage height, 6.00 feet site and datum then in use), from rating curve extended above 300 second-feet.

Remarks.- Numerous canal head-gate regulations materially affected natural discharge after June 1.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	186	176	14	11	528	58	7.0	21	666	75	1.2
2	171	149	6.0	12	573	60	6.2	22	678	71	5.8
3	168	131	3.6	13	725	62	4.9	23	607	50	6.0
4	214	124	2.4	14	760	64	2.8	24	517	50	4.2
5	227	115	4.2	15	561	59	1.5	25	460	45	4.0
6	264	102	10	16	522	83	1.4	26	398	42	4.7
7	426	88	9.2	17	512	74	4.5	27	356	27	4.5
8	458	80	8.8	18	528	72	6.8	28	304	21	3.0
9	485	69	10	19	652	66	6.8	29	248	24	2.0
10	492	61	9.6	20	699	66	4.0	30	211	13	4.9
								31	196		2.4
Monthly mean discharge, in second-feet.....									444	72.9	5.37
Runoff, in inches.....									1.76	0.28	0.02

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	3.93	519	3.86	500	4.17	591	4.60	725	4.44	672	4.47	681
8	3.97	531	4.04	552	4.40	660	4.58	718	4.45	675	4.50	690
N	3.93	519	4.04	552	4.45	675	4.50	690	4.42	666	4.50	690
4	3.90	510	3.98	534	4.49	697	4.47	681	4.37	651	4.45	675
8	3.84	495	3.93	519	4.48	684	4.50	690	4.36	648	4.41	663
12	3.80	485	3.94	522	4.57	714	4.48	684	4.48	684	4.38	654
	May 23		May 24		May 25		May 26		May 27		May 28	
4	4.35	645	4.05	555	3.79	482	3.57	428	3.36	375		
8	4.30	630	4.01	543	3.77	478	3.54	420	3.38	380	3.08	316
N	4.25	615	3.96	528	3.74	470	3.48	405	3.32	365		
4	4.16	588	3.82	490	3.66	450	3.40	385	3.23	346	2.98	296
8	4.06	558	3.75	472	3.58	430	3.30	360	3.15	330		
12	4.05	555	3.76	475	3.57	428	3.28	356	3.12	324	2.87	274
	May 29		May 30		May 31		June 1		June 2		June 3	
4					2.46	204	2.32	183				
8	2.79	258	2.57	220	2.49	208	2.32	183				
N					2.44	201	2.30	180				
4	2.69	238	2.46	204	2.39	194	2.27	176				
8					2.35	184	2.21	166				
12	2.60	225	2.40	195	2.30	180	2.15	158				

Supplemental record.- May 18, 10 a.m., 4.11 feet, 573 sec.-ft.; May 20, 6 p.m., 4.42 ft., 666 sec.-ft.

## Butter Creek near Pine City, Oreg.

Location.- Lat. 45°33', long. 119°18', in S½ sec. 22, T. 1 N., R. 28 E., half a mile below Matlock Canyon, 6 miles southeast of Pine City, and 20 miles south of Hermiston.

Drainage area.- 291 square miles.

Gage-height record.- Water-stage recorder graph except period 12:30 p.m. May 19 to 10:30 a.m. May 24, when there was no gage-height record.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 205 second-feet and extended to peak stage. Discharge for period of no gage-height record computed on basis of unpublished records for station at Foley's Bridge near Echo.

Maxima.- May-June 1948: Discharge, 261 second-feet May 19 (gage height, 2.70 feet). 1921 to April 1948: Discharge, 1,600 second-feet Jan. 28, 1942 (gage height, 7.91 feet).

Remarks.- Small diversions above station for irrigation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	93	83	20	11	114	48	16	21	210	56	7.4
2	90	73	20	12	105	52	15	22	190	57	7.1
3	82	65	18	13	120	66	14	23	170	53	6.8
4	107	67	18	14	118	62	13	24	154	47	7.1
5	115	63	25	15	111	51	12	25	140	42	6.4
6	114	56	24	16	106	46	8.2	26	128	36	6.8
7	120	51	22	17	107	44	7.4	27	127	32	6.4
8	115	47	21	18	129	42	7.8	28	118	28	6.4
9	109	49	19	19	240	46	7.8	29	106	21	7.4
10	114	47	17	20	230	44	7.8	30	95	22	7.4
								31	90		6.8
Monthly mean discharge, in second-feet .....									128	49.9	12.5
Runoff, in inches .....									0.51	0.19	0.05

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	1.48	105	1.55	113	2.28	202						
8	1.47	103	1.57	115	2.40	220						
N	1.49	106	1.69	130	2.66	255						
4	1.51	108	1.75	137								
8	1.52	109	1.79	142								
12	1.53	111	1.97	164								
May 23		May 24		May 25		May 26		May 27		May 28		
4					1.78	141	1.67	127	1.71	132		
8									1.69	130	1.58	117
N			1.89	154					1.69	130		
4			1.87	151	1.77	139	1.67	127	1.66	126	1.60	119
8			1.85	149					1.64	124		
12			1.82	145	1.72	133	1.65	125	1.61	120	1.56	114
May 29		May 30		May 31		June 1		June 2		June 3		
4					1.32	85	1.39	94				
8					1.32	85	1.31	84	1.21	73	1.14	65
N					1.38	93	1.28	81				
4	1.47	103	1.38	93	1.41	96	1.27	80	1.21	73	1.13	64
8					1.37	91	1.25	78				
12	1.46	102	1.35	89	1.35	89	1.23	75	1.18	70	1.13	64
June 4		June 5		June 6		June 7		June 8		June 9		
4	1.13	64	1.12	63	1.06	57	1.01	52	.96	47	.92	44
8											.92	44
N											.92	44
4	1.18	70	1.11	62	1.04	55	.99	50	.94	46	.92	44
8											.98	49
12	1.16	68	1.08	59	1.03	54	.98	49	.93	45	1.04	55
June 10		June 11		June 12		June 13		June 14		June 15		
4	1.00	51	.90	42	.98	49	1.06	57	1.06	57		
8	1.00	51	.91	43	.97	48	1.14	65	1.18	70	1.01	52
N	.93	45	.96	47	.95	46	1.08	59	1.12	63		
4	.92	44	1.02	53	.94	46	1.09	60	1.08	59	.98	49
8	.91	43	1.04	55	.97	48	1.06	57	1.06	57		
12	.91	43	1.00	51	1.78	141	1.03	54	1.04	55	.97	48
June 16		June 17		June 18		June 19		June 20		June 21		
4										.98	49	
8	.95	46	.93	45	.90	42	.98	49	.90	42	1.02	53
N											1.07	58
4	.95	46	.92	44	.89	41	.94	46	.93	45	1.12	63
8											1.12	63
12	.95	46	.90	42	.93	45	.91	43	.95	46	1.09	60

Supplemental record.- May 27, 3 a.m., 1.62 ft., 121 sec.-ft.; June 9, 9:30 a.m., 1.33 ft., 87 sec.-ft.; June 10, 6 a.m., 0.95 ft., 46 sec.-ft.; June 11, 10 a.m., 0.98 ft., 49 sec.-ft.; June 12, 10 p.m., 1.20 ft., 72 sec.-ft., 11 p.m., 1.12 ft., 63 sec.-ft.; June 14, 5 a.m., 1.24 ft., 76 sec.-ft.

## John Day River Basin

John Day River at Prairie City, Oreg.

**Location.**- Lat. 44°27', long. 118°43', in NE¼ sec. 10, T. 13 S., R. 33 E., 600 feet upstream from power plant and outlet of Prairie power canal, a third of a mile below Dixie Creek, and three-quarters of a mile southwest of Prairie City. Datum of gage is 3,496.99 feet above mean sea level, datum of 1929.

**Drainage area.**- 231 square miles.

**Gage-height record.**- Water-stage recorder graph.

**Discharge record.**- Stage-discharge relation defined by current-meter measurements.

**Maxima.**- May-June 1948: Discharge, 1,150 second-feet 1:30 a.m. May 28 (gage height, 5.11 feet).

1926 to April 1948: Discharge observed, 1,550 second-feet Mar. 19, 1932 (gage height, 4.7 feet, former site and datum), from rating curve extended above 500 second-feet.

**Remarks.**- Diversions above station for irrigation and for power; diversion in Prairie power canal measured as 60 second-feet Apr. 21 and May 27, 57 second-feet June 20, and 37 second-feet Aug. 10.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	240	576	80	11	311	507	51	21	600	300	32
2	221	583	76	12	296	420	44	22	948	278	32
3	232	654	83	13	314	372	40	23	915	253	26
4	273	780	80	14	329	328	38	24	905	226	28
5	265	704	95	15	341	307	38	25	917	203	26
6	299	652	86	16	365	314	36	26	975	162	24
7	435	637	80	17	479	278	32	27	1,080	136	24
8	455	687	66	18	519	286	28	28	1,090	110	28
9	398	622	60	19	497	291	28	29	914	83	24
10	348	571	51	20	452	289	28	30	724	85	22
								31	630		20
Monthly mean discharge, in second-feet									542	390	45.4
Runoff, in inches									2.70	1.88	0.23

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	3.40	462	3.58	526	3.57	522	3.39	459	3.35	445	4.87	1,040
8					3.46	483			3.35	445	4.79	1,010
N					3.42	469			3.36	448	4.62	933
4	3.50	497	3.50	497	3.45	480	3.31	431	3.82	614	4.48	875
8					3.52	504			4.59	921	4.49	879
12	3.56	519	3.64	547	3.50	497	3.33	438	4.81	1,010	4.53	896
	May 23		May 24		May 25		May 26		May 27		May 28	
4									4.94	1,070	5.01	1,100
8	4.63	938	4.60	925	4.59	921	4.70	967	4.95	1,080	5.00	1,100
N									4.98	1,090	4.97	1,090
4	4.55	904	4.51	887	4.57	912	4.72	976	4.99	1,100	4.96	1,080
8									4.95	1,080	4.90	1,060
12	4.57	912	4.53	696	4.64	942	4.82	1,020	5.06	1,130	4.83	1,020
	May 29		May 30		May 31		June 1		June 2		June 3	
4	4.74	984									3.60	606
8	4.69	963	4.14	737	3.87	633	3.75	588	3.75	588	3.82	614
N	4.65	946									3.86	629
4	4.49	879	4.04	698	3.82	614	3.66	555	3.72	576	3.93	655
8	4.31	805									4.16	745
12	4.27	789	4.00	682	3.79	602	3.73	580	3.76	591	4.21	765
	June 4		June 5		June 6		June 7		June 8		June 9	
4	4.25	781	4.13	733	3.98	674	3.90	644	4.20	761		
8	4.35	813	4.10	721	3.97	671	3.92	652	4.16	745	3.90	644
N	4.29	797	4.06	705	3.93	655	3.91	646	4.01	666		
4	4.24	777	4.01	686	3.87	633	3.85	625	3.92	652	3.79	602
8	4.19	757	3.97	671	3.85	625	3.83	617	3.66	636		
12	4.16	745	3.98	674	3.87	633	3.89	640	3.90	644	3.78	599
	June 10		June 11		June 12		June 13		June 14		June 15	
4												
8	3.76	591	3.58	526	3.34	442	3.17	385	3.05	348	2.89	299
N												
4	3.59	529	3.44	476	3.20	395	3.08	357	2.93	311	2.92	306
8												
12	3.75	588	3.37	452	3.20	395	3.06	351	2.88	296	3.00	332
	June 16		June 17		June 18		June 19		June 20		June 21	
4	2.99	329			2.79	270						
8	2.98	326	2.84	285	2.80	273	2.90	302	2.78	267	2.91	305
N	3.02	338			2.82	279						
4	2.88	298	2.80	273	2.84	285	2.82	279	2.93	311	2.87	293
8	2.84	285			2.95	317						
12	2.84	285	2.77	265	2.96	320	2.77	265	2.94	314	2.85	288

**Supplemental record.**- May 28, 1:30 a.m., 5.11 ft., 1,150 sec.-ft.

## John Day River at Picture Gorge, near Dayville, Oreg.

Location.- Lat. 44°31'20", long. 119°37'30", in sec. 20, T. 12 S., R. 26 E., on John Day Highway, 0.7 mile upstream from Rock Creek bridge and 7 miles northwest of Dayville. Datum of gage is 2,232.10 feet above mean sea level, datum of 1929.

Drainage area.- 1,640 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 4,100 second-feet and extended to peak stage.

Maxima.- May-June 1948: Discharge, 6,520 second-feet 9 a.m. May 22 (gage height, 13.72 feet).

1926 to April 1948: Discharge, 6,000 second-feet Mar. 19, 1932 (gage height, 14.0 feet), from rating curve extended above 2,300 second-feet.

Remarks.- Many diversions above station for irrigation.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,940	2,870	615	11	2,080	2,620	419	21	3,150	1,720	224
2	1,780	2,640	567	12	1,930	2,300	387	22	5,580	1,650	196
3	1,760	2,590	515	13	1,920	1,980	361	23	5,070	1,470	180
4	2,200	2,790	487	14	1,950	1,770	334	24	4,130	1,330	167
5	2,140	2,980	548	15	1,920	1,580	310	25	4,490	1,210	158
6	2,230	2,770	585	16	1,970	1,640	288	26	4,540	1,090	149
7	2,610	2,600	540	17	2,210	1,660	257	27	4,400	962	148
8	2,890	2,680	508	18	2,550	1,570	245	28	4,270	871	155
9	2,650	2,720	477	19	2,910	1,490	240	29	4,040	744	177
10	2,340	2,480	441	20	3,190	1,540	232	30	3,540	663	175
								31	3,240		160
Monthly mean discharge, in second-feet .....									2,955	1,899	330
Runoff, in inches .....									2.08	1.29	0.23

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4			8.91	2,500	9.19	2,680	10.17	3,380	9.64	3,000	12.43	5,260
8	8.32	2,150	8.98	2,540	9.38	2,820	10.00	3,250	9.56	2,940	13.67	6,470
N			9.07	2,600	9.53	2,920	9.93	3,200	9.50	2,900	13.28	6,080
4	8.52	2,260	9.06	2,590	9.72	3,050	9.84	3,140	9.58	2,960	12.72	5,530
8			9.05	2,580	9.82	3,120	9.75	3,080	10.28	3,460	12.52	5,340
12	8.73	2,390	9.08	2,610	9.83	3,130	9.69	3,030	11.26	4,220	12.44	5,270
	May 23		May 24		May 25		May 26		May 27		May 28	
4	12.40	5,230					11.42	4,360				
8	12.38	5,210	11.67	4,570	11.20	4,170	12.06	4,910	11.55	4,470	11.34	4,290
N	12.34	5,170					11.90	4,760				
4	12.13	4,970	11.47	4,400	11.06	4,050	11.64	4,540	11.40	4,340	11.30	4,260
8	12.00	4,850					11.48	4,410				
12	11.86	4,730	11.32	4,270	11.06	4,050	11.53	4,450	11.37	4,310	11.26	4,220
	May 29		May 30		May 31		June 1		June 2		June 3	
4												
8	11.18	4,150	10.41	3,560	10.08	3,310						
N							9.45	2,860	9.11	2,630	9.03	2,570
4	10.99	3,990	10.28	3,460	9.90	3,180						
8							9.25	2,720	9.05	2,580	9.14	2,650
12	10.69	3,770	10.21	3,410	9.70	3,040						
	June 4		June 5		June 6		June 7		June 8		June 9	
4												
8			9.69	3,030	9.30	2,760	9.05	2,580	9.16	2,660	9.31	2,770
N			9.63	2,990					9.22	2,700	9.20	2,690
4	9.60	2,970	9.47	2,880	9.19	2,680	9.00	2,550	9.33	2,780	9.11	2,630
8												
12												
	June 10		June 11		June 12		June 13		June 14		June 15	
4	9.02	2,560	9.14	2,650								
8	8.93	2,510	9.24	2,720								
N	8.85	2,460	9.20	2,690	8.58	2,300	8.05	1,980	7.65	1,780	7.23	1,560
4	8.79	2,420	9.12	2,630								
8	8.72	2,380	9.02	2,560								
12	8.89	2,480	8.90	2,490	8.24	2,090	7.83	1,860	7.44	1,670	7.13	1,520
	June 16		June 17		June 18		June 19		June 20		June 21	
4												
8	7.28	1,590	7.45	1,680	7.27	1,580	7.10	1,500	7.15	1,520	7.58	1,740
N												
4	7.53	1,720	7.35	1,620	7.23	1,560	7.04	1,470	7.21	1,560	7.62	1,760
8												
12	7.53	1,720	7.33	1,620	7.15	1,520	7.03	1,460	7.34	1,620	7.54	1,720

Supplemental record.- May 22, 9 a.m., 13.72 ft., 6,520 sec.-ft.; May 26, 9 a.m., 12.08 ft., 4,930 sec.-ft.



## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

John Day River at Service Creek, Oreg.

Location.- Lat. 44°48', long. 120°00', in NE $\frac{1}{4}$  sec. 18, T. 9 S., R. 23 E., a quarter of a mile downstream from Service Creek and three-quarters of a mile southwest of Service Creek post office. Datum of gage is 1,635.83 feet above mean sea level, datum of 1929.

Drainage area.- 5,090 square miles.

Gage-height record.- Water-stage recorder graph; adjusted for sluggish intake action 7 p.m. June 11 to 5 a.m. June 18, noon June 25 to 7 p.m. June 29, 6 a.m. June 30 to July 8.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 17,100 second-feet and extended to peak stage. Shifting-control method used May 22, June 10 to July 31.

Maxima.- May-June 1948: Discharge, 23,900 second-feet noon May 22 (gage height, 15.25 feet).

1929 to April 1945: Discharge, 28,900 second-feet Mar. 19, 1932 (gage height, 16.75 feet), from rating curve extended above 11,000 second-feet.

Remarks.- Many diversions above station for irrigation.

Mean discharge, in second-feet, 1948

mean discharge, in second-feet, 1941											
Day	May	June	July	Day	May	June	July	Day	May	June	July
1	8,960	13,000	3,050	11	8,060	10,300	1,670	21	13,100	7,820	945
2	6,510	12,400	2,670	12	7,390	8,920	1,580	22	21,400	7,580	900
3	6,120	12,200	2,430	13	7,760	8,170	1,470	23	19,700	6,510	828
4	8,190	13,900	2,250	14	8,440	7,230	1,350	24	17,800	5,770	782
5	7,910	13,400	2,410	15	8,220	6,520	1,250	25	17,100	5,120	746
6	7,910	12,200	2,770	16	8,410	6,440	1,170	26	18,800	4,560	710
7	9,750	11,500	2,440	17	9,480	6,380	1,100	27	19,800	4,050	686
8	10,800	11,300	2,220	18	11,100	6,760	1,050	28	20,600	3,680	674
9	9,810	11,400	2,010	19	13,200	7,680	1,000	29	17,400	3,560	706
10	8,780	10,900	1,850	20	14,500	7,090	1,000	30	14,400	3,460	730
								31	14,300		678
Monthly mean discharge, in second-feet .....									12,050	8,327	1,456
Runoff, in inches .....									2.73	1.83	0.33

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4							12.48	14,400	11.98	13,100	14.05	19,300
8	10.22	8,970	11.02	10,700	11.66	12,300	12.71	15,000	11.91	12,900	14.98	22,600
N							12.78	15,200	11.95	13,000	15.25	23,900
4	10.70	10,000	11.37	11,600	12.51	14,500	12.56	14,600	11.95	13,000	15.10	23,000
8							12.34	14,000	11.95	13,000	14.78	22,500
12	10.86	10,300	11.44	11,700	12.37	14,100	12.11	13,400	12.08	13,300	14.28	21,100
	May 23		May 24		May 25		May 26		May 27		May 28	
4	13.95	20,200	13.16	17,900	12.73	16,700	12.86	17,000	13.35	18,400	13.85	20,000
8	13.85	20,000	13.16	17,900	12.81	16,900	13.20	18,000	13.60	19,200	14.30	21,500
N	13.84	19,900	13.24	18,100	12.98	17,400	13.70	19,500	14.10	20,700	14.39	21,600
4	13.73	19,600	13.14	17,800	13.00	17,400	13.93	20,200	14.18	20,900	14.24	21,100
8	13.52	19,000	12.97	17,300	12.89	17,100	13.80	19,800	13.97	20,300	13.88	20,000
12	13.32	18,400	12.80	16,900	12.86	17,000	13.47	18,800	13.81	19,800	13.68	19,400
	May 29		May 30		May 31		June 1		June 2		June 3	
4					11.76	14,300	11.20	12,900	10.93	12,200	10.74	11,800
8	13.21	18,000	11.88	14,600	11.96	14,800	11.27	13,100	10.93	12,200	10.78	11,800
N					12.06	15,000	11.32	13,200	11.07	12,600	11.01	12,400
4	12.77	16,800	11.63	14,000	11.84	15,000	11.32	13,200	11.12	12,700	11.05	12,500
8					11.52	13,700	11.20	12,900	11.03	12,500	10.96	12,300
12	12.30	15,600	11.80	13,600	11.29	13,100	11.06	12,600	10.88	12,100	10.90	12,200
	June 4		June 5		June 6		June 7		June 8		June 9	
4	10.89	12,100			10.87	12,100	10.61	11,400	10.45	11,000	10.73	11,700
8	11.34	13,200	11.46	13,600	10.92	12,200	10.59	11,400	10.46	11,000	10.85	11,500
N	11.99	14,900			10.99	12,400	10.68	11,600	10.57	11,300	10.62	11,400
4	12.04	15,000	11.29	13,100	10.95	12,300	10.66	11,600	10.61	11,400	10.55	11,300
8	12.00	14,900			10.86	12,000	10.58	11,400	10.59	11,400	10.60	11,400
12	11.79	14,400	11.02	12,400	10.72	11,700	10.51	11,200	10.75	11,800	10.44	11,000
	June 10		June 11		June 12		June 13		June 14		June 15	
4	10.38	10,800	10.58	10,200								
8	10.37	10,800	10.89	10,900								
N	10.37	10,800	10.90	10,900	9.96	8,840	9.63	8,190	9.10	7,200	8.72	6,510
4	10.36	10,800	10.61	10,200								
8	12.00	15,400	10.40	9,780								
12	10.60	10,200	10.26	9,490	9.80	8,500	9.41	7,780	8.85	6,740	8.60	6,310
	June 16		June 17		June 18		June 19		June 20		June 21	
4					8.50	6,140	9.30	7,580				
8	8.56	6,240	8.73	6,530	8.65	6,400	9.34	7,650	9.05	7,110	9.28	7,540
N					8.73	6,530	9.32	7,610				
4	8.76	6,580	8.58	6,280	9.10	7,200	9.39	7,740	8.89	6,820	9.68	8,280
8					9.28	7,540	9.46	7,870				
12	8.82	6,690	8.40	5,980	9.29	7,560	9.38	7,720	8.97	6,960	9.69	8,300

Supplemental record.- May 26, 6 p.m., 14.05 ft., 20,600 sec.-ft.; June 10, 10 p.m., 10.58 ft., 10,200 sec.-ft.; June 11, 10 a.m., 11.02 ft., 11,200 sec.-ft.

## John Day River at McDonald Ferry, Oreg.

Location.- Lat. 45°35', long. 120°25', in NW¼ sec. 11, T. 1 N., R. 19 E., at McDonald Ferry, half a mile downstream from Rock Creek and 10 miles east of Klondike. Datum of gage is 392.27 feet above mean sea level, datum of 1929.

Drainage area.- 7,580 square miles.

Gage-height record.- Water-stage recorder graph except for period 2 a.m. June 20 to 4 p.m. June 21 for which a graph was drawn based on fragmentary records.

Discharge record.- Stage-discharge relation defined by current-meter measurements. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 25,000 second-feet 2:30 p.m. May 23 (gage height, 9.83 feet).

1904 to April 1948: Discharge, 27,800 second-feet (revised) Feb. 6, 1907 (gage height, 10.8 feet, from hourly gage readings).

Stage known, 12.8 feet, probably occurred in 1894 (discharge, 39,100 second-feet, revised, from rating curve extended above 22,000 second-feet by logarithmic plotting).

Remarks.- Diversions above station for irrigation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	8,130	14,600	3,740	11	9,370	12,100	2,260	21	15,000	8,680	1,220
2	7,740	13,200	3,420	12	8,680	11,800	2,080	22	14,100	9,210	1,180
3	6,920	12,400	3,130	13	8,160	11,500	1,980	23	21,400	8,590	1,140
4	6,810	12,400	2,890	14	8,560	9,890	1,860	24	19,700	7,500	1,060
5	9,310	14,400	2,800	15	9,120	8,290	1,730	25	18,000	6,670	995
6	8,740	13,200	3,070	16	8,870	8,090	1,620	26	17,500	5,990	940
7	8,800	12,000	3,170	17	9,110	8,090	1,500	27	20,000	5,400	870
8	10,700	11,100	2,890	18	10,300	7,660	1,410	28	20,800	4,870	813
9	11,400	10,900	2,660	19	11,900	6,720	1,330	29	21,400	4,430	804
10	10,400	11,800	2,450	20	14,100	8,990	1,270	30	17,700	4,120	795
								31	14,800		813
Monthly mean discharge, in second-feet									12,500	9,546	1,867
Runoff, in inches									1.90	1.41	0.28

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	6.22	8,740	6.45	9,470	7.02	11,400	7.45	12,900	8.03	15,200	7.66	13,700
8	8.29	8,960	6.61	9,990	7.12	11,700	7.72	14,000	8.12	15,600	7.65	13,700
N	6.38	9,250	6.75	10,500	7.21	12,100	7.88	14,600	8.12	15,600	7.65	13,700
4	6.41	9,340	6.83	10,700	7.26	12,200	7.90	14,700	7.96	14,900	7.66	13,700
8	6.41	9,340	6.87	10,900	7.29	12,400	7.87	14,600	7.83	14,400	7.78	14,200
12	6.42	9,370	6.93	11,100	7.32	12,500	7.93	14,800	7.73	14,000	8.54	17,300
	May 23		May 24		May 25		May 26		May 27		May 28	
4	9.07	19,600	9.23	20,300	8.76	18,200	8.53	17,200	8.84	18,600	9.14	19,900
8	9.50	21,600	9.30	20,200	8.80	18,400	8.62	17,600	9.08	19,700	9.37	21,000
N	9.78	22,800	9.13	19,900	8.75	18,200	8.64	17,700	9.39	21,100	9.48	21,500
4	9.80	22,900	9.02	19,400	8.68	17,900	8.61	17,500	9.42	21,200	9.45	21,300
8	9.64	22,200	8.88	18,800	8.58	17,400	8.63	17,600	9.18	20,100	9.34	20,800
12	9.38	21,000	8.77	18,300	8.49	17,100	8.73	18,100	9.06	19,600	9.32	20,700
	May 29		May 30		May 31		June 1		June 2		June 3	
4	9.50	21,600	8.95	19,100	8.03	15,200	8.03	15,200	7.56	13,400	7.30	12,400
8	9.62	22,100	8.80	18,400	7.93	14,800	8.07	15,400	7.57	13,400	7.33	12,500
N	9.61	22,000	8.64	17,700	7.84	14,500	7.92	14,800	7.55	13,300	7.36	12,600
4	9.47	21,400	8.47	17,000	7.83	14,400	7.78	14,200	7.47	13,100	7.35	12,600
8	9.31	20,700	8.32	16,400	7.85	14,500	7.64	13,700	7.43	12,900	7.27	12,300
12	9.14	19,900	8.15	15,700	7.92	14,800	7.55	13,300	7.33	12,500	7.19	12,000
	June 4		June 5		June 6		June 7		June 8		June 9	
4	7.20	12,000	7.64	13,700	7.64	13,700	7.23	12,100	6.96	11,200	6.77	10,500
8	7.32	12,500	7.98	15,000	7.58	13,400	7.25	12,200	6.99	11,300	6.85	10,800
N	7.37	12,600	8.02	15,200	7.50	13,100	7.24	12,200	7.01	11,400	6.92	11,000
4	7.34	12,500	7.96	14,900	7.45	12,900	7.18	12,000	6.85	11,100	6.92	11,000
8	7.30	12,400	7.85	14,500	7.37	12,600	7.09	11,600	6.88	10,900	6.98	11,200
12	7.31	12,400	7.74	14,100	7.27	12,300	7.00	11,300	6.80	10,600	7.04	11,500
	June 10		June 11		June 12		June 13		June 14		June 15	
4	7.05	11,500	6.62	10,000	7.38	12,700	7.00	11,300	6.78	10,600	6.17	8,590
8	7.12	11,700	6.74	10,400	7.17	12,000	7.35	12,600	6.82	10,700	6.10	8,370
N	7.66	13,700	7.73	14,000	7.17	12,000	7.03	11,400	6.62	10,000	6.06	8,250
4	7.10	11,700	7.87	14,600	7.02	11,400	6.97	11,200	6.48	9,570	6.02	8,130
8	6.86	10,800	7.34	12,500	6.82	10,700	6.73	10,400	6.36	9,180	5.99	8,040
12	6.72	10,400	7.11	11,700	6.67	10,200	6.54	9,760	6.26	8,870	5.92	7,830
	June 16		June 17		June 18		June 19		June 20		June 21	
4	5.87	7,680	5.76	7,350	5.96	7,950	6.07	8,280				
8	6.15	8,520	5.75	7,320	5.87	7,680	6.20	8,680				
N	6.25	8,840	6.32	9,050	5.85	7,620	6.27	8,900				
4	6.07	8,280	6.17	8,590	5.81	7,500	6.32	9,050				
8	5.84	7,590	6.05	8,220	5.77	7,380	6.34	9,120			6.15	8,520
12	5.78	7,410	6.06	8,250	5.80	7,470	6.34	9,120			6.16	8,560

Supplemental record.- May 23, 2:30 p.m., 9.83 ft., 25,000 sec.-ft.; May 27, 2 p.m., 9.47 ft., 21,400 sec.-ft.; May 28, 1 p.m., 9.48 ft., 21,500 sec.-ft.; May 29, 10 a.m., 9.64 ft., 22,200 sec.-ft.; June 10, 11 a.m., 7.75 ft., 14,100 sec.-ft.; June 11, 3 p.m., 7.99 ft., 15,100 sec.-ft.; June 12, 5 a.m., 7.48 ft., 13,100 sec.-ft.; June 13, 6 a.m., 7.68 ft., 13,800 sec.-ft.; June 16, 11:30 a.m., 6.25 ft., 8,840 sec.-ft.; June 17, 2 p.m., 6.35 ft., 9,150 sec.-ft.

Strawberry Creek above Slide Creek, near Prairie City, Oreg.

Location.- Lat. 44°20', long. 118°39', in SW $\frac{1}{4}$  sec. 20, T. 14 S., R. 34 E., 100 feet up-stream from Slide Creek and 8 $\frac{1}{2}$  miles south of Prairie City.

Drainage area.- 7.2 square miles.

Gage-height record.- Water-stage recorder graph except for period July 14-31, when there was no gage-height record.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Shifting-control method used May 27 to June 9. Discharge for period of no gage-height record computed on basis of records for other stations in John Day River Basin.

Maxima.- May-June 1948: Discharge, 172 second-feet 5 a.m. June 8 (gage height, 2.23 feet).

1930 to April 1948: Discharge, 150 second-feet June 9, 1933 (gage height, 2.44 feet), from rating curve extended above 85 second-feet.

Remarks.- No diversion above station.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	10	106	52	11	17	108	27	21	35	85	14
2	10	116	49	12	16	92	25	22	44	89	13
3	12	132	45	13	17	89	23	23	46	83	12
4	14	138	42	14	18	86	22	24	49	76	11
5	15	136	39	15	19	84	20	25	57	72	10
6	17	140	37	16	25	82	19	26	68	68	10
7	22	136	35	17	32	79	17	27	103	62	11
8	20	159	33	18	32	74	16	28	147	59	11
9	19	147	31	19	30	72	15	29	129	56	11
10	17	122	29	20	31	76	14	30	117	53	10
								31	108		9.8
Monthly mean discharge, in second-feet									41.8	95.9	23.0
Runoff, in inches									6.69	14.86	3.68

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4												
8	1.64	32	1.64	32	1.62	30	1.63	31	1.67	34	1.78	45
N												
4												
8	1.65	32	1.63	31	1.63	31	1.65	32	1.73	40	1.80	47
12												
	May 23		May 24		May 25		May 26		May 27		May 28	
4									2.08	81	2.20	129
8									2.10	88	2.28	149
N	1.78	45	1.80	47	1.89	57	1.98	68	2.19	107	2.28	155
4									2.23	118	2.32	168
8									2.23	124	2.20	145
12	1.80	47	1.86	54	1.92	60	2.06	78	2.22	127	2.17	140
	May 29		May 30		May 31		June 1		June 2		June 3	
4												
8	2.12	131	2.05	118	1.99	108	1.97	104	2.01	111	2.12	131
N												
4	2.08	124	2.03	115	1.99	108	1.99	108	2.06	120	2.15	136
8												
12	2.07	122	2.02	113	1.97	104	2.00	109	2.09	125	2.14	134
	June 4		June 5		June 6		June 7		June 8		June 9	
4	2.00	129	2.05	138	2.07	142	1.98	125	2.20	166	2.10	147
8	2.03	134	2.02	133	2.08	143	2.00	129	2.12	151	2.07	142
N	2.06	140	2.04	136	2.07	142	2.01	131	2.19	164	2.12	151
4	2.06	140	2.05	138	2.07	142	2.05	138	2.17	160	2.14	155
8	2.10	147	2.04	136	2.05	138	2.05	138	2.12	151	2.08	147
12	2.07	142	2.00	129	2.08	143	2.19	164	2.10	147	2.00	133
	June 10		June 11		June 12		June 13		June 14		June 15	
4												
8	1.87	124	1.79	109	1.69	92	1.66	88				
N									1.64	84	1.63	83
4	1.82	115	1.78	108	1.68	91	1.68	91				
8												
12	1.84	118	1.73	99	1.67	89	1.66	88	1.65	86	1.63	83
	June 16		June 17		June 18		June 19		June 20		June 21	
4												
8	1.63	83	1.61	80	1.57	74	1.56	72	1.59	76	1.64	84
N												
4												
8	1.62	81	1.58	75	1.56	72	1.56	72	1.61	80	1.68	91

Supplemental record.- May 28, 3 p.m., 2.33 ft., 170 sec.-ft.; June 8, 5 a.m., 2.23 ft., 172 sec.-ft.

## North Fork John Day River near Dale, Oreg.

Location.- Lat. 45°00', long. 118°57', in SE $\frac{1}{4}$  sec. 35, T. 6 S., R. 31 E., three-eighths of a mile downstream from Desolation Creek and  $\frac{1}{4}$  miles northeast of Dale. Datum of gage is 2,775.85 feet above mean sea level, datum of 1929.

Drainage area.- 525 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 6,000 second-feet and extended to peak stage.

Maxima.- May-June 1948: Discharge, 8,170 second-feet 11 p.m. May 26 (gage height, 10.48 feet).

1929 to April 1948: Discharge, 4,990 second-feet May 14, 1932 (gage height, 8.4 feet).

Remarks.- Several small diversions above station for irrigation and mining.

## Mean discharge, in second-feet, 1948

mean discharge, in second-feet, 1940												
Day	May	June	July	Day	May	June	July	Day	May	June	July	
1	978	4,100	780	11	1,400	2,890	426	21	3,660	2,360	252	
2	882	4,410	700	12	1,350	2,500	396	22	4,770	2,010	236	
3	936	4,780	645	13	1,790	2,270	359	23	4,850	1,770	221	
4	1,120	5,430	615	14	1,990	2,020	356	24	5,080	1,570	212	
5	1,060	4,420	670	15	2,140	1,870	313	25	5,750	1,400	201	
6	1,400	4,280	595	16	2,680	1,760	292	26	6,540	1,250	192	
7	2,250	4,050	580	17	3,340	1,580	278	27	7,390	1,120	190	
8	2,030	4,280	520	18	3,120	1,690	278	28	6,680	1,010	224	
9	1,720	3,750	480	19	3,090	2,050	271	29	5,040	930	215	
10	1,550	3,590	439	20	3,280	1,890	271	30	4,190	852	195	
								31	4,080		179	
Monthly mean discharge, in second-feet.....									3,101	2,589	373	
Runoff, in inches .....									6.81	5.50	0.82	

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Gage height, in feet, and discharge, in second-feet, at Indian Lake, 1895												
Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
May 17			May 18		May 19		May 20		May 21		May 22	
4	7.24	3,400	7.18	3,330	6.88	2,980	7.21	3,360	7.36	3,540	8.22	4,690
8	7.22	3,370	7.05	3,170	6.83	2,920	7.08	3,210	7.27	3,430	8.20	4,660
N	7.18	3,330	6.94	3,040	6.80	2,890	6.96	3,070	7.19	3,340	8.16	4,600
4	7.14	3,280	6.86	2,960	6.95	3,060	6.98	3,090	7.33	3,510	8.16	4,600
8	7.17	3,310	6.88	2,980	7.25	3,410	7.23	3,390	7.78	4,080	8.49	5,070
12	7.23	3,390	6.97	3,080	7.31	3,480	7.41	3,600	8.14	4,580	8.54	5,140
May 23			May 24		May 25		May 26		May 27		May 28	
4	8.39	4,930	8.57	5,180	8.91	5,680	9.33	6,320	10.14	7,600	9.99	7,360
8	8.26	4,740	8.40	4,940	8.80	5,520	9.16	6,060	9.93	7,270	9.76	7,000
N	8.12	4,550	8.24	4,720	8.68	5,340	9.00	5,820	9.70	6,900	9.52	6,610
4	8.11	4,530	8.24	4,720	8.75	5,440	9.18	6,090	9.80	7,060	9.31	6,280
8	8.50	5,080	8.68	5,340	9.40	6,420	10.07	7,490	10.13	7,590	9.14	6,030
12	8.70	5,370	8.95	5,740	9.43	6,470	10.40	8,030	10.25	7,780	8.98	5,790
May 29			May 30		May 31		June 1		June 2		June 3	
4	8.80	5,520	8.02	4,410	7.93	4,280	7.93	4,280	8.20	4,660	8.29	4,790
8	8.58	5,190	7.87	4,203	7.80	4,110	7.81	4,120	8.06	4,460	8.14	4,580
N	8.38	4,910	7.73	4,020	7.67	3,940	7.68	3,950	7.90	4,240	7.97	4,340
4	8.27	4,760	7.63	3,890	7.61	3,860	7.59	3,840	7.78	4,080	7.86	4,190
8	8.22	4,690	7.82	4,140	7.72	4,010	7.76	4,060	8.00	4,380	8.54	5,140
12	8.16	4,600	8.01	4,390	7.88	4,210	8.04	4,440	8.30	4,800	9.46	6,520
June 4			June 5		June 6		June 7		June 8		June 9	
4	9.29	6,260	8.17	4,620	8.09	4,510	7.95	4,310	7.80	4,110	7.69	3,970
8	8.91	5,680	8.04	4,440	7.93	4,280	7.78	4,080	7.89	4,230	7.50	3,720
N	8.62	5,250	7.91	4,250	7.81	4,120	7.63	3,890	8.11	4,530	7.36	3,540
4	8.40	4,940	7.83	4,150	7.69	3,970	7.54	3,770	7.95	4,310	7.29	3,460
8	8.29	4,790	7.97	4,340	7.88	4,210	7.67	3,940	7.96	4,320	7.48	3,690
12	8.28	4,770	8.18	4,630	8.09	4,510	7.84	4,160	7.88	4,210	7.72	4,010
June 10			June 11		June 12		June 13		June 14		June 15	
4	7.54	3,770	7.02	3,130	6.60	2,670						
8	7.31	3,480	6.88	2,980	6.49	2,560	6.25	2,310	6.00	2,060	5.80	1,880
N	7.14	3,280	6.76	2,850	6.40	2,460						
4	6.99	3,100	6.65	2,720	6.32	2,380	6.11	2,170	5.84	1,920	5.73	1,820
8	7.02	3,130	6.84	2,710	6.32	2,380						
12	7.07	3,190	6.65	2,720	6.39	2,450	6.14	2,200	5.90	1,970	5.77	1,850
June 16			June 17		June 18		June 19		June 20		June 21	
4					5.50	1,620	6.21	2,270	5.73	1,820		
8	5.73	1,820	5.48	1,600	5.50	1,620	6.20	2,260	5.67	1,760	6.43	2,490
N					5.54	1,650	6.00	2,060	5.65	1,740		
4	5.61	1,710	5.38	1,520	5.58	1,680	5.85	1,920	5.77	1,850	6.26	2,320
8					5.66	1,750	5.78	1,860	6.00	2,060		
12	5.58	1,680	5.42	1,560	5.97	2,030	5.77	1,850	6.28	2,340	6.11	2,170

Supplemental record.- May 22, 3 a.m., 8.38 ft., 4,910 sec.-ft.; May 26, 11 p.m., 10.48 ft., 8,170 sec.-ft.; June 4, 10 a.m., 9.47 ft., 6,530 sec.-ft.

## North Fork John Day River at Monument, Oreg.

Location.- Lat. 44°49', long. 119°26', in E½ sec. 1, T. 9 S., R. 27 E., just downstream from entrance to canyon, three-quarters of a mile west of Monument.

Drainage area.- 2,520 square miles.

Gage-height record.- Water-stage recorder graph except for periods 8 p.m. May 29 to 8 p.m. May 30 and July 8-31, for which there was no gage-height record.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 12,000 second-feet and extended to peak stage. Discharge for periods of no gage-height record computed on basis of reconstructed gage-height graph or records for station near Dale and Middle Fork John Day River at Ritter.

Maxima.- May-June 1948: Discharge, 21,100 second-feet 3 a.m. May 22 (gage height, 14.67 feet).

1925 to April 1948: Discharge, 22,000 second-feet Mar. 18, 1932 (gage height, 14.8 feet), from rating curve extended above 9,000 second-feet.

Remarks.- Many small diversions above station for irrigation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	4,670	8,250	1,690	11	5,600	6,270	960	21	10,700	5,310	540
2	4,070	8,080	1,540	12	5,170	5,130	880	22	17,200	4,610	500
3	4,130	8,040	1,420	13	6,060	4,830	800	23	13,600	3,950	480
4	6,020	10,300	1,330	14	6,340	4,320	740	24	12,600	3,460	460
5	5,170	8,740	1,440	15	6,070	3,970	680	25	12,600	3,020	440
6	5,430	7,950	1,560	16	6,480	4,200	640	26	14,100	2,690	430
7	7,390	7,400	1,300	17	7,470	3,960	620	27	16,300	2,400	420
8	7,380	7,320	1,200	18	8,300	4,180	620	28	16,600	2,200	450
9	6,620	7,000	1,100	19	10,300	4,740	600	29	11,900	1,990	470
10	6,110	6,590	1,000	20	10,400	4,240	580	30	8,900	1,880	440
								31	8,920		400
Monthly mean discharge, in second-feet									8,794	5,227	830
Runoff, in inches									4.02	2.31	0.38

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	8.50	7,160	8.92	7,920	10.00	9,950	10.79	11,600	9.73	9,430	14.56	20,800
8	8.72	7,560	9.12	8,280	10.52	11,000	10.52	11,000	9.74	9,450	13.73	18,600
N	8.77	7,650	9.22	8,460	10.37	10,700	10.25	10,400	9.64	9,260	13.03	16,800
4	8.78	7,660	9.20	8,420	10.07	10,100	9.93	9,810	9.60	9,180	12.54	15,600
8	8.79	7,680	9.25	8,520	10.13	10,200	9.70	9,370	12.47	15,400	12.15	14,600
12	8.80	7,700	9.35	8,700	10.66	11,300	9.62	9,220	13.41	17,800	12.07	14,400
May 23		May 24		May 25		May 26		May 27		May 28		
4	12.23	14,800	11.63	13,400	11.43	13,000	12.10	14,500	13.10	17,000	13.72	18,600
8	12.03	14,300	11.54	13,200	11.48	13,100	12.43	15,300	13.20	17,200	13.52	18,100
N	11.71	13,600	11.32	12,700	11.34	12,800	12.14	14,600	12.95	16,600	12.90	16,500
4	11.43	13,000	11.05	12,100	11.16	12,400	11.82	13,800	12.60	15,700	12.60	15,700
8	11.23	12,500	10.88	11,700	11.02	12,000	11.56	13,300	12.40	15,200	12.22	14,800
12	11.31	12,700	11.13	12,300	11.31	12,700	11.88	14,000	13.66	18,400	11.82	13,800
May 29		May 30		May 31		June 1		June 2		June 3		
4	11.22	12,500	9.73	9,430	9.88	9,710	9.36	8,720	9.20	8,420	9.20	8,420
N			9.52	9,030								
4	10.60	11,200	9.35	8,700	9.33	8,670	9.07	8,190	9.08	8,200	9.00	8,060
8			9.24	8,500								
12	10.00	9,950	9.18	8,380	9.00	8,060	8.76	7,630	8.74	7,590	8.80	7,700
			9.36	8,720								
June 4		June 5		June 6		June 7		June 8		June 9		
4	10.15	10,200						8.34	6,890			
8	10.64	11,200	9.50	8,990	9.17	8,370	8.86	7,810	8.58	7,300	8.62	7,380
N	10.51	11,000						8.58	7,300			
4	10.38	10,700	9.25	8,520	8.89	7,860	8.61	7,360	8.68	7,480	8.25	6,740
8	10.07	10,100						8.86	7,810			
12	9.77	9,500	8.94	7,950	8.58	7,300	8.28	6,790	8.70	7,520	7.97	6,260
June 10		June 11		June 12		June 13		June 14		June 15		
4	8.13	6,530	8.30	6,820								
8	8.31	6,940	8.22	6,680	7.37	5,280	7.26	5,110	6.83	4,440	6.54	4,010
N	8.12	6,510	8.00	6,310								
4	7.88	6,110	7.83	6,020	7.19	4,990	7.03	4,740	6.72	4,280	6.50	3,950
8	7.79	5,950	7.66	5,750								
12	8.15	6,560	7.49	5,470	7.05	4,780	6.87	4,500	6.55	4,010	6.47	3,900
June 16		June 17		June 18		June 19		June 20		June 21		
4	6.57	4,060	6.58	4,070	6.47	3,900	6.86	4,490				
8	6.63	4,140	6.54	4,010	6.50	3,950	7.10	4,850	6.60	4,100	7.50	5,490
N	6.73	4,300	6.48	3,920	6.70	4,250	7.20	5,010				
4	6.70	4,250	6.39	3,790	6.78	4,370	7.16	4,950	6.58	4,070	7.54	5,550
8	6.82	4,430	6.50	3,950	6.81	4,420	6.98	4,670				
12	6.66	4,190	6.46	3,890	6.86	4,490	6.82	4,430	6.96	4,640	7.27	5,120

Supplemental record.- May 21, 6 p.m., 9.72 ft., 9,410 sec.-ft., 10 p.m., 12.51 ft., 15,500 sec.-ft.; May 22, 3 a.m., 14.67 ft., 21,100 sec.-ft.; May 28, 2 a.m., 13.52 ft., 18,100 sec.-ft.

## Camas Creek near Ukiah, Oreg.

Location.- Lat. 45°09', long. 118°49', in SE<sup>1</sup> sec. 3, T. 5 S., R. 32 E., 1.2 miles upstream from Cable Creek and 6 miles east of Ukiah.

Drainage area.- 121 square miles.

Gage-height record.- Water-stage recorder graph except for period of faulty intake action, 12 p.m. May 26 to 2 p.m. June 4, for which discharge was computed on basis of records for other stations in John Day River Basin.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 810 second-feet and extended to peak stage by logarithmic plotting.

Maxima.- May-June 1948: Discharge, 1,090 second-feet 6 a.m. May 13 (gage height, 3.68 feet).

1914-17, 1919-24, 1932 to April 1948: Discharge, 2,350 second-feet Dec. 12, 1946 (gage height, 4.58 feet).

Remarks.- Small diversions above station for irrigation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	419	480	51	11	710	188	24	21	710	173	12
2	348	440	44	12	665	166	22	22	766	167	12
3	391	480	40	13	992	164	20	23	773	155	11
4	512	538	37	14	844	150	18	24	738	135	10
5	461	405	57	15	725	134	16	25	764	118	10
6	572	354	45	16	732	128	15	26	816	105	9.5
7	852	311	41	17	771	118	14	27	886	93	9.1
8	763	268	34	18	730	120	14	28	779	80	11
9	702	234	29	19	846	136	14	29	600	68	10
10	718	219	26	20	746	141	14	30	480	61	9.1
								31	460		8.4
Monthly mean discharge, in second-feet .....									687	211	22.2
Runoff, in inches .....									6.54	1.95	0.21

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height		Discharge		Gage height		Discharge		Gage height		Discharge		Gage height		Discharge		
	May 17		May 18		May 19		May 20		May 21		May 22						
4			3.29	748	3.49	912											
8	3.34	787	3.24	710	3.42	852	3.29	748	3.22	695	3.33	779					
N			3.22	695	3.39	827											
4	3.31	763	3.21	688	3.38	819	3.26	725	3.21	688	3.34	787					
8			3.26	725	3.38	819											
12	3.28	740	3.47	894	3.36	803	3.26	725	3.32	771	3.37	811					
		May 23		May 24		May 25		May 26		May 27		May 28					
4																	
8	3.33	779	3.28	740	3.30	755	3.37	811									
N																	
4	3.29	748	3.24	710	3.30	755	3.31	763									
8																	
12	3.32	771	3.30	755	3.37	811	3.52	938									
		May 29		May 30		May 31		June 1		June 2		June 3					
4																	
8																	
N																	
4																	
8																	
12																	
		June 4		June 5		June 6		June 7		June 8		June 9					
4																	
8			2.80	413													
N					2.70	358	2.61	313	2.51	268							
4	2.97	518	2.75	386													
8																	
12	2.88	461	2.72	369	2.65	333	2.55	286	2.47	251	2.43	235					
		June 10		June 11		June 12		June 13		June 14		June 15					
4																	
8					2.22	164	2.22	164	2.18	153	2.12	137					
N	2.39	220	2.30	188	2.20	158	2.18	153	2.15	145	2.10	132					
4																	
8																	
12	2.34	202	2.25	173	2.28	182	2.23	167	2.12	137	2.08	127					
		June 16		June 17		June 18		June 19		June 20		June 21					
4																	
8	2.06	123	2.05	120	2.02	114	2.14	142									
N																	
4	2.11	135	2.02	114	2.07	125	2.12	137	2.09	130	2.25	173					
8																	
12	2.08	127	2.01	111	2.09	130	2.08	127	2.26	176	2.24	170					

## Middle Fork John Day River at Ritter, Oreg.

Location.- Lat. 44°53', long. 119°08', in NW¼ sec. 8, T. 8 S., R. 30 E., at bridge half a mile south of Ritter.

Drainage area.- 526 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge, 2,500 second-feet 4 a.m. May 28 (gage height, 6.37 feet).

1929 to April 1948: Discharge, 4,000 second-feet Mar. 19, 1932 (gage height, 7.78 feet).

Remarks.- Several small diversions above station for irrigation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	840	1,530	320	11	1,040	1,330	182	21	1,540	1,190	109
2	750	1,490	287	12	948	1,130	175	22	2,000	948	102
3	725	1,530	264	13	1,030	1,030	158	23	2,030	794	94
4	955	1,840	250	14	1,070	934	147	24	1,960	694	91
5	889	1,770	270	15	1,040	860	138	25	2,000	612	86
6	970	1,710	260	16	1,120	856	130	26	2,160	546	85
7	1,380	1,660	247	17	1,230	769	122	27	2,370	490	84
8	1,440	1,670	223	18	1,230	740	118	28	2,380	438	88
9	1,320	1,590	206	19	1,410	804	117	29	2,020	389	91
10	1,200	1,490	188	20	1,580	776	115	30	1,690	355	84
								31	1,620		76
Monthly mean discharge, in second-feet .....									1,417	1,066	158
Runoff, in inches .....									3.11	2.26	0.35

## Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height		Discharge		Gage height		Discharge		Gage height		Discharge		Gage height		Discharge		Gage height		Discharge								
	May 17		May 18		May 19		May 20		May 21		May 22		May 23		May 24		May 25		May 26		May 27		May 28				
4	N	5.13	1,250	5.15	1,260	5.34	1,440	5.57	1,660	5.37	1,460	5.86	1,950	4	N	6.01	2,100	5.90	1,990	5.89	1,980	6.01	2,100	6.28	2,400	6.37	2,500
8		5.12	1,240	5.08	1,200	5.34	1,440	5.56	1,650	5.37	1,460	5.88	1,970			5.99	2,080	5.90	1,990	5.90	1,990	6.04	2,130	6.28	2,400	6.32	2,440
12		5.12	1,240	5.09	1,210	5.29	1,390	5.49	1,580	5.37	1,460	5.94	2,030			5.94	2,030	5.88	1,970	5.92	2,010	6.03	2,120	6.24	2,350	6.26	2,380
12		5.12	1,240	5.09	1,210	5.26	1,360	5.46	1,550	5.70	1,790	5.96	2,050			5.89	1,980	5.84	1,930	5.90	1,990	6.06	2,160	6.17	2,280	6.21	2,320
4	N	5.12	1,240	5.09	1,210	5.28	1,380	5.38	1,470	5.51	1,600	5.96	2,050	4	N	5.87	1,960	5.83	1,920	5.91	2,000	6.08	2,180	6.27	2,390	6.20	2,310
8		5.12	1,240	5.09	1,210	5.59	1,680	5.36	1,450	5.71	1,800	6.01	2,100	5.89		1,980	5.89	1,980	6.02	2,110	6.27	2,390	6.33	2,450	6.16	2,270	
12		5.12	1,240	5.09	1,210	5.28	1,380	5.38	1,470	5.51	1,600	5.96	2,050	5.87		1,960	5.83	1,920	5.91	2,000	6.08	2,180	6.27	2,390	6.20	2,310	
12		5.12	1,240	5.09	1,210	5.59	1,680	5.36	1,450	5.71	1,800	6.01	2,100	5.89		1,980	5.89	1,980	6.02	2,110	6.27	2,390	6.33	2,450	6.16	2,270	
4	N	6.01	2,100	5.90	1,990	5.89	1,980	6.01	2,100	6.28	2,400	6.37	2,500	4	N	6.11	2,210	5.66	1,750	5.59	1,680	5.49	1,580	5.44	1,530	5.48	1,570
8		5.99	2,080	5.90	1,990	5.90	1,990	6.04	2,130	6.28	2,400	6.32	2,440	8		6.03	2,120	5.63	1,720	5.55	1,640	5.51	1,600	5.45	1,520	5.46	1,550
12		5.94	2,030	5.88	1,970	5.92	2,010	6.03	2,120	6.24	2,350	6.26	2,380	12		5.90	1,990	5.58	1,670	5.53	1,620	5.45	1,540	5.39	1,480	5.42	1,510
12		5.89	1,980	5.84	1,930	5.90	1,990	6.06	2,160	6.17	2,280	6.21	2,320	4		5.82	1,910	5.54	1,630	5.43	1,520	5.40	1,490	5.34	1,440	5.39	1,480
4	N	5.87	1,960	5.83	1,920	5.91	2,000	6.08	2,180	6.27	2,390	6.20	2,310	8	5.74	1,830	5.55	1,640	5.54	1,630	5.36	1,450	5.34	1,440	5.40	1,490	
8		5.89	1,980	5.89	1,980	6.02	2,110	6.27	2,390	6.33	2,450	6.16	2,270	12	5.71	1,800	5.60	1,690	5.46	1,550	5.41	1,500	5.42	1,510	5.56	1,650	
12		5.89	1,980	5.89	1,980	6.02	2,110	6.27	2,390	6.33	2,450	6.16	2,270	4	5.83	1,920	5.71	1,800	5.66	1,750	5.59	1,680	5.57	1,660	5.56	1,650	
12		5.83	1,920	5.71	1,800	5.66	1,750	5.59	1,680	5.56	1,650	5.58	1,670	8	5.78	1,870	5.63	1,720	5.58	1,670	5.53	1,620	5.59	1,680	5.43	1,520	
4	N	5.72	1,810	5.66	1,750	5.59	1,680	5.56	1,650	5.58	1,670	5.42	1,510	8	5.72	1,810	5.66	1,750	5.59	1,680	5.56	1,650	5.58	1,670	5.42	1,510	
8		5.72	1,810	5.66	1,750	5.59	1,680	5.56	1,650	5.58	1,670	5.42	1,510	12	5.72	1,810	5.66	1,750	5.59	1,680	5.56	1,650	5.58	1,670	5.42	1,510	
12		5.72	1,810	5.66	1,750	5.59	1,680	5.56	1,650	5.58	1,670	5.42	1,510	4	5.39	1,480	5.26	1,360	5.02	1,160	4.89	1,050	4.76	955	4.65	875	
4		5.39	1,480	5.26	1,360	5.02	1,160	4.89	1,050	4.76	955	4.65	875	8	5.25	1,360	5.15	1,260	4.93	1,080	4.82	1,000	4.71	918	4.60	840	
8	N	5.25	1,360	5.15	1,260	4.93	1,080	4.82	1,000	4.71	918	4.60	840	12	5.40	1,490	5.11	1,230	4.93	1,080	4.79	978	4.66	882	4.61	847	
12		5.40	1,490	5.11	1,230	4.93	1,080	4.79	978	4.66	882	4.61	847	4	5.39	1,480	5.26	1,360	5.02	1,160	4.89	1,050	4.76	955	4.65	875	
4		5.25	1,360	5.15	1,260	4.93	1,080	4.82	1,000	4.71	918	4.60	840	8	5.25	1,360	5.15	1,260	4.93	1,080	4.82	1,000	4.71	918	4.60	840	
12		5.40	1,490	5.11	1,230	4.93	1,080	4.79	978	4.66	882	4.61	847	12	5.40	1,490	5.11	1,230	4.93	1,080	4.79	978	4.66	882	4.61	847	
4	N	5.39	1,480	5.26	1,360	5.02	1,160	4.89	1,050	4.76	955	4.65	875	4	5.39	1,480	5.26	1,360	5.02	1,160	4.89	1,050	4.76	955	4.65	875	
8		5.25	1,360	5.15	1,260	4.93	1,080	4.82	1,000	4.71	918	4.60	840	8	5.25	1,360	5.15	1,260	4.93	1,080	4.82	1,000	4.71	918	4.60	840	
12		5.40	1,490	5.11	1,230	4.93	1,080	4.79	978	4.66	882	4.61	847	12	5.40	1,490	5.11	1,230	4.93	1,080	4.79	978	4.66	882	4.61	847	
4		5.39	1,480	5.26	1,360	5.02	1,160	4.89	1,050	4.76	955	4.65	875	8	5.25	1,360	5.15	1,260	4.93	1,080	4.82	1,000	4.71	918	4.60	840	
8	N	5.25	1,360	5.15	1,260	4.93	1,080	4.82	1,000	4.71	918	4.60	840	12	5.40	1,490	5.11	1,230	4.93	1,080	4.79	978	4.66	882	4.61	847	
12		5.40	1,490	5.11	1,230	4.93	1,080	4.79	978	4.66	882	4.61	847	4	5.39	1,480	5.26	1,360	5.02	1,160	4.89	1,050	4.76	955	4.65	875	
4		5.39	1,480	5.26	1,360	5.02	1,160	4.89	1,050	4.76	955	4.65	875	8	5.25	1,360	5.15	1,260	4.93	1,080	4.82	1,000	4.71	918	4.60	840	
8		5.25	1,360	5.15	1,260	4.93	1,080	4.82	1,000	4.71	918	4.60	840	12	5.40	1,490	5.11	1,230	4.93	1,080	4.79	978	4.66	882	4.61	847	
12	N	5.40	1,490	5.11	1,230	4.93	1,080	4.79	978	4.66	882	4.61	847	4	5.39	1,480	5.26	1,360	5.02	1,160	4.89	1,050	4.76	955	4.65	875	
4		5.39	1,480	5.26	1,360	5.02	1,160	4.89	1,050	4.76	955	4.65	875	8	5.25	1,360	5.15	1,260	4.93	1,080	4.82	1,000	4.71	918	4.60	840	
8		5.25	1,360	5.15	1,260	4.93	1,080	4.82	1,000	4.71	918	4.60	840	12	5.40	1,490	5.11	1,230	4.93	1,080	4.79	978	4.66	882	4.61	847	
12		5.40	1,490	5.11	1,230	4.93	1,080	4.79	978	4.66	882	4.61	847	4	5.39	1,480	5.26	1,360	5.02	1,160	4.89	1,050	4.76	955	4.65	875	
4	N	5.25	1,360	5.15	1,260	4.93	1,080	4.82	1,000	4.71	918	4.60	840	8	5.25	1,360	5.15	1,260	4.93	1,080	4.82	1,000	4.71	918	4.60	840	
12		5.40	1,490	5.11	1,230	4.93	1,080	4.79	978	4.66	882	4.61	847	12	5.40	1,490	5.11	1,230	4.93	1,080	4.79	978	4.66	882	4.61	847	
4		5.39	1,480	5.26	1,360	5.02	1,160	4.89	1,050	4.76	955	4.65	875	8	5.25	1,360	5.15	1,260	4.93	1,080	4.82	1,000	4.71	918	4.60	840	
8		5.25	1,360	5.15	1,260	4.93	1,080	4.82	1,000	4.71	918	4.60	840	12	5.40	1,490	5.11	1,230	4.93	1,080	4.79	978	4.66	882	4.61	847	
12	N	5.40	1,490	5.11	1,230	4.93	1,080	4.79	978	4.66	882	4.61	847	4	5.39	1,480	5.26	1,360	5.02	1,160	4.89	1,050	4.76	955	4.65	875	
4		5.39	1,480	5.26	1,360	5.02	1,160	4.89	1,050	4.76	955	4.65	875	8	5.25	1,360	5.15	1,260	4.93	1,080	4.82	1,000	4.71	918	4.60	840	
8		5.25	1,360	5.15	1,260	4.93	1,080	4.82	1,000	4.71	918	4.60	840	12	5.40	1,490	5.11	1,230	4.93	1,080	4.79	978	4.66	882	4.61	847	
12		5.40	1,490	5.11	1,230	4.93	1,080	4.79	978	4.66	882	4.61	847	4	5.39	1,480	5.26	1,360	5.02	1,160	4.89	1,050	4.76	955	4.65	875	
4	N	5.25	1,360	5.15	1,260	4.93	1,080	4.82	1,000	4.71	918	4.60	840	8	5.25	1,360	5.15	1,260	4.93	1,080	4.82	1,000	4.71	918	4.60	840	
12		5.40	1,490	5.11	1,230	4.93	1,080	4.79	978	4.66	882	4.61	847	12	5.40	1,490	5.11	1,230	4.93	1,080	4.79	978	4.66	882	4.61	847	
4		5.39	1,480	5.26	1,360	5.02	1,160	4.89	1,050	4.76	955	4.65	875	8	5.25	1,360	5.15	1,260	4.93	1,080	4.82	1,000	4.71	918	4.60	840	
8		5.25	1,360	5.15	1,260	4.93	1,080	4.82	1,000	4.71	918	4.60	840	12	5.40	1,490	5.11	1,230	4.93	1,080	4.79	978	4.66	882	4.61	847	
12	N	5.40	1,490	5.11	1,230	4.93	1,080	4.79	978	4.66	882	4.61	847	4	5.39	1,480	5.26	1,360	5.02	1,160	4.89	1,050	4.76	955	4.65	875	
4		5.39	1,480	5.26	1,360	5.02	1,160	4.89	1,050	4.76	955	4.65	875	8	5.25	1,360	5.15	1,260	4.93	1,080	4.82	1,000	4.71	918	4.60	840	
8		5.25	1,360	5.15	1,260	4.93	1,080																				

Supplemental record.- May 21, 3 p.m., 5.40 ft., 1,490 sec.-ft., 6 p.m., 5.47 ft., 1,560 sec.-ft.; June 10, 9 p.m., 5.60 ft., 1,690 sec.-ft.

Fox Creek at gorge, near Fox, Oreg.  
(The lower part of this stream is named Cottonwood Creek)

Location.- Lat. 44°37', long. 119°16', in NW¼ sec. 17, T. 11 S., R. 29 E., at head of gorge, 6 miles southwest of Fox.

Drainage area.- 92 square miles.

Gage-height record.- Water-stage recorder graph except for period 2 a.m. June 16 to noon June 19, when there was no gage-height record.

Discharge record.- Stage-discharge relation defined by current meter measurements below 320 second-feet and extended to peak stage on basis of slope-area measurement. Discharge for period of no gage-height record computed on basis of records for other stations in John Day River Basin.

Maxima.- May-June 1948: Discharge, 1,850 second-feet a.m. May 22 (gage height, 5.84 feet), by slope-area method.

1930 to April 1948: Discharge, 800 second-feet Mar. 18, 1932, from rating curve extended above 250 second-feet; gage height observed, 5.37 feet Feb. 21, 1943 (affected by ice).

Remarks.- Several diversions above station for irrigation.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	176	226	35	11	154	215	18	21	648	217	6.8
2	134	153	28	12	142	148	16	22	1,090	170	6.5
3	132	122	26	13	161	104	14	23	422	125	5.8
4	223	222	24	14	167	96	12	24	324	100	5.5
5	161	213	32	15	163	84	11	25	287	83	5.5
6	179	151	35	16	167	120	9.8	26	390	70	5.2
7	272	100	34	17	196	100	8.8	27	312	60	5.0
8	276	174	28	18	319	135	8.4	28	362	51	4.0
9	218	205	24	19	696	340	7.7	29	250	41	3.6
10	181	153	21	20	532	240	7.4	30	205	40	3.8
								31	225		4.0
Monthly mean discharge, in second-feet.										295	14.7
Runoff, in inches.										3.70	0.18

Gage height, in feet, and discharge, in second-feet, at indicated time, 1948

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	2.39	172	2.70	250	3.71	614	3.69	606	3.07	364	5.68	1,730
8	2.44	184	2.78	272	3.76	637	3.74	628	3.06	361	4.99	1,280
N	2.50	198	2.86	296	4.11	805	3.56	549	3.05	358	4.49	995
4	2.53	206	2.94	321	4.01	755	3.37	473	3.67	596	4.62	760
8	2.57	216	3.11	378	3.91	705	3.23	420	4.83	1,190	3.67	596
12	2.61	226	3.58	557	3.77	642	3.13	386	5.57	1,650	3.48	517
	May 23		May 24		May 25		May 26		May 27		May 28	
4	3.38	477	3.00	340	2.81	281	3.35	465	2.83	287	3.27	434
8	3.31	449	3.01	344	2.85	287	3.35	465	2.82	284	3.02	347
N	3.23	420	2.99	337	2.82	284	3.19	406	2.81	281	2.97	350
4	3.15	392	2.92	314	2.79	275	3.03	350	2.76	267	2.93	318
8	3.06	361	2.86	296	2.78	272	2.94	321	2.94	321	2.86	296
12	3.01	344	2.81	281	3.07	364	2.86	296	3.71	614	2.82	284
	May 29		May 30		May 31		June 1		June 2		June 3	
4	2.79	275	2.52	203	2.68	245	2.58	218	2.40	174	2.13	119
8	2.74	261	2.49	196	2.65	236	2.65	236	2.34	161	2.11	116
N	2.70	250	2.47	191	2.62	228	2.72	256	2.30	152	2.10	114
4	2.65	236	2.43	181	2.57	218	2.66	239	2.25	142	2.11	116
8	2.62	228	2.49	220	2.50	198	2.57	216	2.19	130	2.20	132
12	2.57	216	2.75	264	2.48	193	2.47	191	2.16	125	2.29	150
	June 4		June 5		June 6		June 7		June 8		June 9	
4	2.40	174	2.71	253	2.27	146	2.05	106	2.06	108	2.71	253
8	2.57	216	2.65	236	2.23	138	2.03	103	2.28	148	2.62	228
N	2.65	236	2.58	218	2.20	132	2.02	101	2.39	172	2.53	206
4	2.70	250	2.49	196	2.15	123	1.99	96	2.52	203	2.41	176
8	2.71	253	2.39	172	2.11	116	1.96	92	2.66	239	2.33	159
12	2.71	253	2.32	156	2.07	109	1.97	94	2.73	258	2.28	148
	June 10		June 11		June 12		June 13		June 14		June 15	
4	2.24	140	2.73	258	2.40	174	2.07	109	2.04	104	1.90	83
8	2.20	132	2.54	208	2.35	163	2.04	104	2.02	101	1.88	80
N	2.17	127	2.49	196	2.29	150	2.03	103	2.00	98	1.87	79
4	2.13	119	2.47	191	2.21	134	2.02	101	1.97	94	1.87	79
8	2.43	181	2.45	186	2.14	121	2.02	101	1.93	88	1.91	84
12	2.85	293	2.43	161	2.10	114	2.04	104	1.91	84	2.06	108
	June 16		June 17		June 18		June 19		June 20		June 21	
4	2.11	116							2.81	281	2.64	234
8									2.66	239	2.60	223
N							3.12	382	2.60	223	2.57	216
4							3.18	403	2.53	206	2.55	210
8							3.10	375	2.55	210	2.53	206
12							2.97	330	2.63	231	2.51	200

Supplemental record.- May 22, 2 a.m., 5.84 ft., 1,850 sec.-ft.; May 27, 6:30 p.m., 2.71 ft., 253 sec.-ft.; June 9, 2 a.m., 2.74 ft., 261 sec.-ft.; June 11, 1 a.m., 2.91 ft., 311 sec.-ft.



Deschutes River Basin

Deschutes River at Moody, near Biggs, Oreg.

Location.- Lat. 45°37', long. 120°54', in SE $\frac{1}{4}$  sec. 26, T. 2 N., R. 15 E., at Moody, 1 $\frac{1}{2}$  miles upstream from mouth and 5 miles southwest of Biggs. Datum of gage is 167.45 feet above mean sea level, datum of 1929.

Drainage area.- 10,500 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 14,200 second-feet. Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 10,500 second-feet 12 p.m. May 27 (gage height, 4.15 feet).

1897-98, 1906 to April 1948: Discharge, 45,600 second-feet Jan. 7, 1923 (gage height, 10.2 feet).

Remarks.- Many diversions in upper river basin for irrigation. Affected by storage in Crane Prairie, Wickiup, Crescent Lake, and Ochoco Reservoirs.

*Mean discharge, in second-feet, 1948*

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	6,650	8,760	5,640	11	6,830	8,580	4,930	21	7,450	7,940	4,780
2	6,440	9,190	5,480	12	6,580	8,390	4,900	22	8,180	7,720	4,610
3	6,340	9,000	5,290	13	6,480	8,520	4,810	23	8,680	7,450	4,460
4	6,720	9,030	5,080	14	6,440	8,540	4,690	24	8,440	7,080	4,410
5	7,790	9,380	5,050	15	6,370	8,080	4,660	25	8,550	6,720	4,320
6	7,230	9,170	5,170	16	6,500	8,120	4,660	26	8,570	6,400	4,290
7	7,340	8,780	5,200	17	6,420	7,530	4,550	27	9,860	6,100	4,290
8	7,530	8,590	5,170	18	6,530	7,260	4,490	28	10,200	5,930	4,580
9	7,560	8,280	5,080	19	6,650	7,610	4,490	29	9,980	5,700	4,520
10	7,190	8,100	4,960	20	6,940	7,810	4,610	30	9,410	5,600	4,350
								31	8,780		4,320
Monthly mean discharge, in second-feet.									7,526	7,839	4,756
Runoff, in inches									0.83	0.83	0.52

*Gage height, in feet, and discharge, in second-feet, at indicated time, 1948*

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 17		May 18		May 19		May 20		May 21		May 22	
4	3.10	6,570	3.14	6,510	3.16	6,580	3.23	6,830	3.32	7,150	3.57	8,100
8	3.13	6,480	3.15	6,540	3.17	6,620	3.25	6,900	3.36	7,300	3.59	8,170
N	3.13	6,480	3.16	6,580	3.18	6,650	3.27	6,970	3.38	7,380	3.59	8,170
4	3.12	6,440	3.15	6,540	3.19	6,680	3.28	7,010	3.43	7,560	3.59	8,170
8	3.11	6,400	3.14	6,510	3.20	6,720	3.29	7,040	3.49	7,790	3.61	8,250
12	3.12	6,440	3.15	6,540	3.21	6,760	3.30	7,080	3.54	7,980	3.65	8,400
	May 23		May 24		May 25		May 26		May 27		May 28	
4	3.70	8,600	3.68	8,520	3.68	8,520	3.69	8,560	4.07	10,100	4.10	10,200
8	3.75	8,800	3.67	8,480	3.70	8,600	3.70	8,600	3.98	9,720	4.08	10,100
N	3.74	8,760	3.66	8,440	3.71	8,640	3.69	8,560	3.96	9,640	4.07	10,100
4	3.72	8,680	3.64	8,370	3.69	8,560	3.68	8,520	4.03	9,920	4.11	10,200
8	3.71	8,640	3.64	8,370	3.68	8,520	3.69	8,560	4.12	10,300	4.08	10,200
12	3.69	8,560	3.65	8,400	3.68	8,520	3.72	8,680	4.13	10,300	4.09	10,200
	May 29		May 30		May 31		June 1		June 2		June 3	
4	4.06	10,000	3.97	9,680	3.79	8,960	3.72	8,680	3.65	9,200	3.84	9,160
8	4.06	10,000	3.94	9,560	3.77	8,880	3.73	8,720	3.87	9,280	3.85	9,120
N	4.01	9,840	3.90	9,400	3.74	8,760	3.74	8,760	3.87	9,280	3.79	8,960
4	4.00	9,800	3.87	9,280	3.72	8,680	3.75	8,800	3.85	9,200	3.77	8,880
8	3.98	9,720	3.84	9,160	3.70	8,600	3.76	8,840	3.84	9,160	3.77	8,880
12	3.97	9,680	3.81	9,040	3.70	8,600	3.78	8,920	3.83	9,120	3.77	8,880
	June 4		June 5		June 6		June 7		June 8		June 9	
4	3.77	8,880	3.89	9,360	3.90	9,400	3.73	8,720	3.72	8,680	3.64	8,370
8	3.79	8,960	3.89	9,360	3.89	9,360	3.74	8,760	3.73	8,720	3.64	8,370
N	3.78	8,920	3.88	9,320	3.85	9,200	3.75	8,800	3.69	8,560	3.62	8,290
4	3.83	9,120	3.90	9,400	3.81	9,040	3.76	8,840	3.68	8,520	3.60	8,210
8	3.86	9,240	3.91	9,440	3.77	8,880	3.75	8,800	3.67	8,480	3.60	8,210
12	3.87	9,280	3.92	9,480	3.74	8,760	3.73	8,720	3.65	8,400	3.57	8,100
	June 10		June 11		June 12		June 13		June 14		June 15	
4	3.54	7,980	3.56	8,060	3.62	8,290	3.59	8,170	3.69	8,560	3.56	8,060
8	3.59	8,170	3.68	8,520	3.62	8,290	3.65	8,400	3.70	8,600	3.55	8,020
N	3.61	8,250	3.65	8,400	3.66	8,440	3.72	8,680	3.71	8,640	3.59	8,170
4	3.54	7,980	3.67	8,480	3.69	8,560	3.71	8,640	3.69	8,560	3.55	8,020
8	3.58	8,130	3.69	8,560	3.65	8,400	3.73	8,720	3.65	8,400	3.56	8,060
12	3.58	8,130	3.66	8,440	3.61	8,250	3.75	8,800	3.80	8,210	3.55	8,020
	June 16		June 17		June 18		June 19		June 20		June 21	
4	3.55	8,020	3.47	7,720	3.34	7,230	3.39	7,410	3.50	7,830	3.52	7,910
8	3.69	8,560	3.44	7,600	3.34	7,230	3.40	7,450	3.50	7,830	3.52	7,910
N	3.60	8,210	3.40	7,450	3.34	7,230	3.44	7,600	3.48	7,750	3.54	7,980
4	3.56	8,060	3.39	7,410	3.34	7,230	3.49	7,790	3.48	7,750	3.54	7,980
8	3.53	7,940	3.39	7,410	3.36	7,300	3.50	7,830	3.51	7,870	3.54	7,980
12	3.51	7,870	3.36	7,300	3.31	7,340	3.49	7,790	3.52	7,910	3.52	7,910

Klickitat River Basin

## Klickitat River near Pitt, Wash.

Location.- Lat. 45°45', long. 120°12', in SW $\frac{1}{4}$  sec. 8, T. 3 N., R. 13 E.,  $3\frac{1}{2}$  miles south of Pitt, 5 miles upstream from Silvias Creek, and 7 miles upstream from mouth at Lyle. Altitude of gage is 285 feet (from river-profile map).

Drainage area.- 1,170 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 6,000 second-feet and extended to peak stage. Gage heights used to half-tenths between 4.4 and 6.8 feet; hundredths below and tenths above these limits. Shifting-control method used May 1 to July 31.

Maxima.- May-June 1948: Discharge, 6,860 second-feet 9:30 a.m. May 27 (gage height, 7.65 feet).

1909-12, 1928 to April 1948: Discharge observed, 21,000 second-feet Dec. 22, 1933 (gage height, 12.5 feet, site and datum then in use).

Remarks.- Small diversions above station for irrigation. No regulation.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,790	3,950	1,850	11	2,570	3,950	1,390	21	3,430	2,640	1,280
2	1,730	3,950	1,750	12	2,570	3,770	1,360	22	3,770	2,500	1,250
3	1,910	4,220	1,670	13	2,720	3,260	1,360	23	3,950	2,360	1,210
4	2,430	4,400	1,610	14	2,570	3,020	1,360	24	4,040	2,230	1,180
5	2,300	4,130	1,560	15	2,500	2,860	1,320	25	4,130	2,160	1,150
6	2,570	4,220	1,560	16	2,570	3,430	1,310	26	4,400	2,100	1,130
7	2,860	4,310	1,500	17	2,640	3,340	1,300	27	6,100	2,040	1,140
8	2,790	4,220	1,440	18	2,640	2,940	1,360	28	5,890	2,040	1,130
9	2,720	4,130	1,440	19	2,640	2,720	1,320	29	5,280	1,970	1,100
10	2,640	3,860	1,380	20	2,940	2,640	1,290	30	4,500	1,970	1,100
								31	4,130		1,090
Monthly mean discharge, in second-feet.....									3,217	3,178	1,351
Runoff, in inches.....									3.17	3.03	1.33

Hood River Basin

## Hood River near Hood River, Oreg.

Location.- Lat. 45°42', long. 121°31', in SE $\frac{1}{4}$  sec. 36, T. 3 N., R. 10 E., at Powerdale, a quarter of a mile upstream from Pacific Power & Light Co.'s plant and three-quarters of a mile south of town of Hood River. Datum of gage is 106.23 feet above mean sea level, datum of 1929.

Drainage area.- 329 square miles.

Gage-height record.- Water-stage recorder graph except for period July 24-26 and part of each day July 21-23, 27, 30, 31, when there was no gage-height record.

Discharge record.- Stage-discharge relation defined by current-meter measurements. Discharge for periods of fragmentary or no gage-height record computed on basis of one gage reading and reconstructed graph.

Maxima.- May-June 1948: Discharge (river only), 2,270 second-feet 6 p.m. May 3 (gage height, 3.95 feet).

1913 to April 1948: Discharge, 34,000 second-feet Jan. 6, 1923 (gage height, 11.1 feet), no diversion by power conduit.

Remarks.- Diversions above station for irrigation. Daily discharge regulated by pondage at sawmill at Dee and by Pacific Power & Light Co.'s conduit which diverts about 450 second-feet around gage.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	574	1,080	324	11	932	1,240	185	21	967	839	84
2	539	1,090	249	12	948	1,120	159	22	1,080	645	66
3	1,270	1,190	215	13	972	1,120	135	23	1,080	550	82
4	1,430	1,080	198	14	684	895	110	24	1,170	485	65
5	1,400	1,050	198	15	820	819	94	25	1,310	426	60
6	1,550	1,160	308	16	884	939	81	26	1,490	388	56
7	1,480	1,270	308	17	939	759	94	27	1,590	375	135
8	1,280	1,280	209	18	873	649	112	28	1,630	384	175
9	1,140	1,170	178	19	838	607	103	29	1,340	397	84
10	1,020	1,050	171	20	871	668	92	30	1,160	402	66
								31	1,120		65
Monthly mean discharge, in second-feet.....									1,115	837	144
Runoff, in inches.....									3.91	2.84	0.50

White Salmon River Basin

White Salmon River near Underwood, Wash.

Location.- Lat. 45°45'00", long. 121°31'30", in NW $\frac{1}{4}$  sec. 14, T. 3 N., R. 10 E., 1,000 feet downstream from Northwestern Electric Co's conduit power plant and 2 miles north of Underwood and mouth.

Drainage area.- 384 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Gage heights used to hundredths. Shifting-control method used May 1 to July 31.

Maxima.- May-June 1948: Discharge, 2,530 second-feet (regulated) 11 p.m. May 26 (gage height, 5.69 feet).

1915-30, 1935 to April 1948: Discharge, 9,700 second-feet Dec. 29, 1917 (gage height, 9.5 feet, datum then in use).

Remarks.- Many diversions near Trout Lake for irrigation. Flow regulated by power plant.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,280	1,830	1,110	11	1,720	1,890	1,000	21	1,800	1,560	856
2	1,230	1,780	1,030	12	1,700	2,000	905	22	1,900	1,490	836
3	1,350	1,860	1,040	13	1,770	1,880	957	23	1,980	1,410	801
4	1,690	1,850	1,010	14	1,780	1,800	920	24	2,020	1,460	842
5	1,760	1,830	1,000	15	1,710	1,660	912	25	2,110	1,280	799
6	1,980	1,770	996	16	1,690	1,820	844	26	2,250	1,280	803
7	2,090	1,800	1,030	17	1,700	1,770	847	27	2,330	1,280	792
8	1,960	1,810	1,080	18	1,690	1,630	868	28	2,330	1,270	822
9	1,840	1,840	1,030	19	1,720	1,540	873	29	2,270	1,130	782
10	1,790	1,830	994	20	1,690	1,530	864	30	2,040	1,060	776
								31	1,900		792
Monthly mean discharge, in second-feet .....									1,841	1,631	910
Runoff, in inches .....									5.53	4.74	2.73

Little White Salmon River Basin

Little White Salmon River at Willard, Wash.

Location.- Lat. 45°47'00", long. 121°37'30", in NW $\frac{1}{4}$  sec. 1, T. 3 N., R. 9 E., at Willard, a quarter of a mile downstream from Lava Creek.

Drainage area.- 117 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements. Gage heights used to half-tenths between 3.4 and 5.0 feet; hundredths below and tenths above these limits.

Maxima.- May-June 1948: Discharge, 771 second-feet 11 a.m. May 6 (gage height, 5.73 feet).

1903-6, 1944 to April 1948: Discharge, 4,140 second-feet Dec. 15, 1946 (gage height, 9.48 feet).

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	440	452	440	11	582	452	396	21	498	464	332
2	440	452	440	12	570	464	385	22	498	464	332
3	558	452	429	13	570	464	374	23	486	464	321
4	666	452	429	14	558	464	374	24	486	464	310
5	691	452	429	15	546	464	363	25	475	464	310
6	771	452	429	16	546	475	363	26	475	464	300
7	744	452	429	17	534	464	352	27	475	464	300
8	691	440	418	18	522	464	352	28	475	464	280
9	642	452	407	19	522	464	342	29	464	452	290
10	618	452	396	20	510	464	342	30	452	452	280
								31	452		270
Monthly mean discharge, in second-feet .....									547	459	362
Runoff, in inches .....									5.39	4.37	3.56

Wind River Basin

## Wind River near Carson, Wash.

Location.- Lat. 45°44'10", long. 121°48'10", in SW¼ sec. 21, T. 3 N., R. 8 E., three-quarters of a mile upstream from Little Wind River, 1 mile northeast of Carson, and 2½ miles upstream from mouth. Discharge measurements made just downstream from mouth of Little Wind River.

Drainage area.- 225 square miles, including that of Little Wind River.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Gage heights used to half-tenths below and tenths above 6.70 feet.

Maxima.- May-June 1948: Discharge, 3,920 second-feet 4 to 5 p.m. May 6 (gage height, 9.58 feet).

1934 to April 1948: Discharge, 16,700 second-feet Dec. 29, 1937 (gage height, 17.30 feet).

Remarks.- Flow occasionally affected by pondage at Forest Service power plant on Trout Creek. No diversion.

*Mean discharge, in second-feet, 1948*

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,180	1,220	468	11	1,670	975	402	21	1,370	715	327
2	1,100	1,180	455	12	1,610	930	389	22	1,370	662	327
3	2,360	1,180	442	13	1,740	890	376	23	1,310	628	316
4	3,290	1,080	428	14	1,670	810	376	24	1,340	592	316
5	3,000	1,020	428	15	1,550	750	364	25	1,460	575	304
6	3,590	1,000	482	16	1,490	850	351	26	1,490	558	304
7	3,290	1,020	482	17	1,550	770	351	27	1,550	540	316
8	2,640	1,000	442	18	1,430	715	339	28	1,610	525	339
9	2,240	950	415	19	1,370	680	339	29	1,430	510	316
10	1,880	910	402	20	1,340	680	339	30	1,250	496	304
								31	1,200		372
Monthly mean discharge, in second-feet .....									1,786	814	304
Runoff, in inches .....									9.15	4.03	1.91

Sandy River Basin

## Sandy River below Bull Run River, near Bull Run, Oreg.

Location.- Lat. 45°27', long. 122°15', in NW¼ sec. 30, T. 1 S., R. 5 E., 1 mile downstream from Bull Run River and 2 miles northwest of Bull Run. Altitude of gage, 202 feet (from river-profile map).

Drainage area.- 440 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge, 8,150 second-feet 9 p.m. May 3 (gage height, 7.92 feet).

1910-14, 1929 to April 1948: Discharge, 58,000 second-feet Mar. 31, 1931 (gage height, 20.6 feet), from rating curve extended above 15,000 second-feet.

Remarks.- No diversion above station for irrigation; about 60,000 acre-feet annually diverted from Bull Run River by Portland Water Bureau. Practically no regulation of flow during period May to July by Bull Run Lake and Lake Ben Morrow Reservoir of Portland Water Bureau; considerable diurnal fluctuation July 19-31 by Bull Run power plant of Portland General Electric Co.

*Mean discharge, in second-feet, 1948*

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2,120	3,130	1,150	11	3,180	2,320	900	21	3,020	2,940	589
2	1,990	3,030	1,060	12	3,210	2,150	864	22	3,080	2,330	618
3	4,210	3,160	1,030	13	3,520	2,090	816	23	3,040	1,970	758
4	5,920	2,770	996	14	3,160	1,810	780	24	3,380	1,760	796
5	5,400	2,530	990	15	2,880	1,650	770	25	3,960	1,620	370
6	6,730	2,560	1,170	16	3,120	1,710	770	26	4,170	1,520	474
7	6,090	2,590	1,200	17	3,160	1,530	687	27	4,180	1,430	1,010
8	4,790	2,490	1,030	18	3,010	1,430	633	28	4,750	1,350	1,200
9	4,170	2,310	966	19	2,730	1,350	721	29	3,960	1,290	1,160
10	3,520	2,110	930	20	2,690	1,640	678	30	3,300	1,230	1,140
								31	3,120		808
Monthly mean discharge, in second-feet .....									3,728	2,080	873
Runoff, in inches .....									9.77	5.22	2.29

Washougal River Basin

Washougal River near Washougal, Wash.

Location.- Lat. 45°37'20", long. 122°18'00", in SE $\frac{1}{4}$  sec. 27, T. 2 N., R. 4 E., half a mile above Cougar Creek and 5 $\frac{1}{2}$  miles northeast of Washougal.Drainage area.- 108 square miles.Gage-height record.- Staff gage read twice daily.Discharge record.- Stage-discharge relation defined by current-meter measurements.Maxima.- May-June 1948: Discharge observed, 3,880 second-feet 4:30 p.m. May 5 (gage height, 6.73 feet).

1944 to April 1948: Discharge observed, 22,100 second-feet Feb. 7, 1945 (gage height, 14.40 feet).

Remarks.- No diversion or regulation.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	614	306	173	11	840	268	151	21	510	326	118
2	588	286	167	12	781	268	140	22	486	306	111
3	1,920	286	156	13	781	232	135	23	414	286	106
4	1,840	268	159	14	781	212	135	24	392	249	106
5	2,010	249	162	15	724	200	130	25	414	249	104
6	2,710	232	187	16	724	190	125	26	369	232	102
7	2,010	215	203	17	668	190	120	27	392	209	130
8	1,380	215	167	18	614	184	120	28	510	193	184
9	1,100	215	151	19	588	173	123	29	392	190	130
10	964	209	151	20	510	268	123	30	326	170	120
								31	306		106
Monthly mean discharge, in second-feet.....									860	256	139
Runoff, in inches.....									9.18	2.44	1.48

Willamette River Basin

Willamette River at Salem, Oreg.

Location.- Lat. 44°56'40", long. 123°02'30", in SW $\frac{1}{4}$  sec. 22, T. 7 S., R. 3 W., 300 feet upstream from highway bridge at Salem. Datum of gage is 113.61 feet above mean sea level, datum of 1929.Drainage area.- 7,280 square miles.Gage-height record.- Water-stage recorder graph.Discharge record.- Stage-discharge relation defined by current-meter measurements.Maxima.- May-June 1948: Discharge, 48,500 second-feet 2 p.m. to 3 p.m. May 5 (gage height, 7.29 feet).

1909-16, 1927 to April 1948: Maximum discharge observed, 315,000 second-feet Nov. 25, 1909 (gage height, 30.5 feet).

Maximum discharge known, 500,000 second-feet Dec. 4, 1861 (gage height, about 39 feet), from rating curve extended above 250,000 second-feet in 1916.

Flood of Feb. 5, 1890, reached a stage of 37.1 feet.

Remarks.- Many small diversions above station for irrigation; part of flow of Salem Canal, which diverts water from North Santiam River, returns to Willamette River below station, through Mill Creek at Salem. Flow regulated at times by Cottage Grove and Fern Ridge Reservoirs. Gage-height record collected in cooperation with U. S. Weather Bureau.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	23,400	24,200	10,800	11	32,300	21,700	8,580	21	25,700	14,900	6,640
2	21,900	23,800	10,500	12	28,700	23,400	8,340	22	25,900	16,300	6,450
3	21,600	23,600	10,100	13	28,200	21,900	7,980	23	25,200	16,000	6,380
4	38,200	24,100	9,650	14	30,600	20,100	7,720	24	24,700	14,700	6,320
5	47,800	22,900	9,330	15	29,800	18,600	7,420	25	25,900	13,600	6,230
6	44,800	21,200	9,360	16	27,400	17,100	7,180	26	28,100	12,900	6,140
7	43,900	21,100	9,880	17	27,300	16,100	7,030	27	29,800	12,400	6,030
8	42,900	22,600	9,970	18	28,300	15,300	6,950	28	30,800	11,900	6,050
9	39,900	23,000	9,430	19	27,600	14,700	6,900	29	31,800	11,400	6,380
10	36,200	21,900	8,880	20	26,300	14,600	6,790	30	28,700	11,100	6,320
								31	25,500		6,050
Monthly mean discharge, in second-feet.....									30,620	18,240	7,799
Runoff, in inches.....									4.85	2.79	1.24

Willamette River at Portland, Oreg.

Location.- Lat. 45°32', long. 122°40', in SE $\frac{1}{4}$  sec. 34, T. 1 N., R. 1 E., at Morrison Street Bridge in Portland, 13 miles upstream from mouth. Datum of gage is 1.15 feet above mean sea level (levels by U. S. Weather Bureau).Drainage area.- 11,250 square miles (authority, U. S. Weather Bureau).Gage-height record.- One or more gage readings daily.Maxima.- May-June 1948: Gage height observed, 29.975 feet 2 to 4 a.m. June 14, read by Portland Harbor Patrol.

1879 to April 1948: Gage height, 33.0 feet June 7, 1894.

Flood stage considered to be 18 feet.

Remarks.- Gage heights affected by backwater from Columbia River to such an extent that there was practically no slope between station and mouth of river. Records furnished by U. S. Weather Bureau.

## Willamette River at Portland, Oreg.--Continued

## Mean gage height, in feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	8.9	29.8	20.2	11	13.7	29.7	12.9	21	16.7	26.1	8.3
2	8.8	29.5	19.7	12	14.3	29.7	12.2	22	18.1	25.6	8.2
3	9.0	29.4	18.8	13	14.4	29.9	11.6	23	19.5	25.1	7.9
4	10.3	29.3	17.9	14	14.3	29.8	10.9	24	20.9	24.6	7.4
5	11.4	29.4	17.2	15	14.0	29.3	10.3	25	22.3	24.1	6.8
6	12.1	29.7	16.6	16	14.4	28.8	9.8	26	23.0	23.4	6.3
7	12.8	29.6	15.8	17	14.8	28.0	9.5	27	24.0	22.8	6.0
8	12.9	29.6	15.2	18	14.7	27.4	9.0	28	25.2	22.0	5.9
9	12.8	29.6	14.5	19	15.0	26.8	8.8	29	26.5	21.4	5.8
10	13.2	29.8	13.8	20	15.7	26.4	8.7	30	28.0	20.6	5.6
								31	29.2		6.0

## Mill Creek at Salem, Oreg.

Location.- Lat. 44°56'05", long. 123°01'00", in NE $\frac{1}{4}$  sec. 26, T. 7 S., R. 3 W., at State Street Bridge in Salem, 220 feet downstream from 19th Street diversion. Datum of gage is 165.50 feet above mean sea level, datum of 1929.

Drainage area.- 108 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge, 430 second-feet (regulated) 8 a.m. May 4 (gage height, 2.82 feet).

1938 to April 1948: Discharge, 1,110 second-feet Feb. 7, 1943 (gage height, 5.53 feet, from floodmark); gage height, 5.61 feet Dec. 15, 1946.

Remarks.- Salem power canal diverts water into Mill Creek near Stayton; several diversions from Mill Creek, including Shelton flood bypass  $\frac{1}{4}$  miles upstream, and 19th Street power diversion 220 feet upstream. Diurnal fluctuation caused by power plants above station.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	76	62	29	11	197	42	4.0	21	88	42	53
2	101	57	28	12	132	57	8.5	22	71	42	53
3	222	56	26	13	234	58	16	23	65	47	47
4	294	52	26	14	191	42	24	24	56	48	51
5	270	44	28	15	156	41	30	25	44	50	57
6	311	45	19	16	146	34	39	26	68	48	52
7	295	45	19	17	142	36	46	27	76	53	58
8	297	45	21	18	110	38	46	28	111	47	58
9	260	44	19	19	94	37	50	29	108	45	58
10	227	51	12	20	106	38	52	30	92	37	56
								31	70		46
Monthly mean discharge, in second-feet .....									154	46.1	36.5
Runoff, in inches .....									-	-	-

## South Yamhill River near Whiteson, Oreg.

Location.- Lat. 45°10'10", long. 123°12'25", in NW $\frac{1}{4}$  sec. 5, T. 5 S., R. 4 W., at Whiteson Bridge on Pacific Highway West, 1 mile downstream from Salt Creek and  $\frac{1}{4}$  miles northwest of Whiteson. Datum of gage is 82.30 feet above mean sea level, datum of 1929.

Drainage area.- 502 square miles.

Gage-height record.- Water-stage recorder graph except for period June 20-29, when there was no gage-height record.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 17,000 second-feet. Discharge for period of no gage-height record computed on basis of records for North Yamhill River near Pike.

Maxima.- May-June 1948: Discharge, 4,340 second-feet 11:30 a.m. May 4 (gage height, 21.03 feet).

1940 to April 1948: Discharge, 24,500 second-feet Jan. 7, 1948 (gage height, 42.12 feet).

Remarks.- Small diversions above station for irrigation. Gage-height record collected in cooperation with U. S. Weather Bureau.

## Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,530	650	166	11	1,970	356	152	21	1,170	280	100
2	1,390	602	162	12	1,750	339	146	22	1,060	270	97
3	1,610	561	157	13	1,780	328	135	23	988	260	94
4	4,020	523	157	14	1,870	318	126	24	920	240	91
5	3,610	506	161	15	1,660	308	115	25	850	230	93
6	3,710	474	177	16	1,520	292	115	26	799	220	91
7	3,590	443	198	17	1,660	278	110	27	772	210	82
8	3,170	403	185	18	1,460	271	108	28	848	195	88
9	2,680	381	177	19	1,340	263	109	29	952	185	96
10	2,280	366	162	20	1,300	270	104	30	834	177	90
								31	724		80
Monthly mean discharge, in second-feet .....									1,736	340	127
Runoff, in inches .....									4.06	0.77	0.30

## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

## North Yamhill River near Pike, Oreg.

Location.- Lat. 45°22'15", long. 123°17'10", in NE $\frac{1}{4}$  sec. 27, T. 2 S., R. 5 W.,  $1\frac{1}{2}$  miles downstream from Haskins Creek and  $1\frac{1}{2}$  miles west of Pike. Datum of gage is 249.2 feet above mean sea level (Corps of Engineers bench mark).

Drainage area.- 48 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 2,600 second-feet.

Maxima.- May-June 1948: Discharge, 610 second-feet 12:30 p.m. May 3 (gage height, 3.45 feet).

1940 to April 1948: Discharge, 3,830 second-feet Dec. 18, 1941 (gage height, 8.24 feet), affected by release of water from log pond upstream.

Remarks.- Occasional diurnal fluctuation caused by small dams upstream; no seasonal regulation. Water supply for city of McMinnville is diverted from Haskins Creek above station, mean annual diversion being about 1 second-foot.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	176	102	35	11	198	70	32	21	176	58	26
2	167	96	35	12	243	68	31	22	164	56	25
3	396	91	34	13	313	66	29	23	152	52	25
4	360	89	34	14	276	65	27	24	139	50	24
5	408	86	36	15	251	64	28	25	128	49	23
6	450	80	41	16	265	61	27	26	126	47	22
7	375	77	38	17	243	59	25	27	124	45	25
8	293	74	37	18	219	58	26	28	155	43	25
9	251	72	35	19	211	57	26	29	130	38	23
10	219	70	33	20	194	64	26	30	117	35	22
								31	107		21
Monthly mean discharge, in second-feet .....									227	64.7	28.9
Runoff, in inches .....									5.44	1.50	0.69

## Molalla River near Canby, Oreg.

Location.- Lat. 45°15', long. 122°41', in NE $\frac{1}{4}$  sec. 9, T. 4 S., R. 1 E., at bridge  $1\frac{1}{2}$  miles south of Canby. Datum of gage is 104.56 feet above mean sea level, datum of 1929.

Drainage area.- 323 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge, 4,380 second-feet 10:30 p.m. May 3 (gage height, 6.19 feet).

1928 to April 1948: Discharge, 25,100 second-feet Jan. 7, 1948 (gage height, 14.9 feet).

Remarks.- Small diversions above station for irrigation; no regulation.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,090	1,120	258	11	1,620	675	200	21	1,190	587	148
2	982	1,040	246	12	1,520	661	194	22	1,180	557	142
3	1,970	982	232	13	1,780	587	182	23	1,140	491	142
4	3,440	878	226	14	1,630	527	175	24	1,150	436	148
5	2,730	774	218	15	1,450	474	170	25	1,300	395	140
6	3,070	735	236	16	1,400	436	165	26	1,320	371	131
7	3,160	720	286	17	1,410	410	160	27	1,270	344	135
8	2,690	698	250	18	1,340	380	148	28	1,490	317	178
9	2,220	640	222	19	1,240	362	155	29	1,400	294	170
10	1,870	581	209	20	1,200	380	155	30	1,240	278	150
								31	1,200		138
Monthly mean discharge, in second-feet .....									1,667	571	184
Runoff, in inches .....									5.95	1.97	0.66

## Pudding River at Aurora, Oreg.

Location.- Lat. 45°14', long. 122°45', in SE $\frac{1}{4}$  sec. 12, T. 4 S., R. 1 W., at highway bridge at Aurora, half a mile upstream from Mill Creek. Datum of gage is 76.79 feet above mean sea level, datum of 1929.

Drainage area.- 493 square miles.

Gage-height record.- Wire-weight gage read twice daily prior to June 30, once daily thereafter.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge observed, 2,760 second-feet 6:20 p.m. May 7 (gage height, 10.64 feet).

1928 to April 1948: Discharge, 19,400 second-feet (revised) Dec. 30, 1937 (gage height, 24.5 feet, from graph based on gage readings), from rating curve extended above 11,600 second-feet.

Maximum stage known, 25.0 feet Jan. 9, 1923 (discharge 20,700 second-feet, revised, from subsequent rating curve extended above 11,600 second-feet).

Remarks.- Small diversions above station; slight regulation at times in summer by mills on tributaries.

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,220	785	186	11	1,800	389	170	21	978	310	124
2	1,100	695	175	12	1,590	431	163	22	920	367	121
3	1,050	621	175	13	1,580	445	160	23	850	339	117
4	2,190	577	162	14	1,640	413	154	24	795	292	117
5	2,550	549	163	15	1,500	381	142	25	760	268	116
6	2,590	521	165	16	1,530	353	141	26	745	251	115
7	2,760	489	175	17	1,260	327	128	27	700	240	112
8	2,670	451	206	18	1,190	314	122	28	738	228	108
9	2,410	425	213	19	1,090	301	124	29	1,020	214	119
10	2,080	401	186	20	1,020	292	122	30	950	199	128
								31	828		121
Monthly mean discharge, in second-feet									1,420	396	146
Runoff, in inches									3.31	0.90	0.34

## Tualatin River near Willamette, Oreg.

Location.- Lat. 45°21'05", long. 122°40'35", in SW $\frac{1}{4}$  sec. 34, T. 2 S., R. 1 E., 300 feet upstream from county bridge and 1 mile northwest of Willamette. Datum of gage is 85.61 feet above mean sea level, datum of 1929 (levels by Corps of Engineers).

Drainage area.- 710 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge, 3,420 second-feet 2 p.m. to 10 p.m. May 8 (gage height, 7.55 feet).

1928 to April 1948: Discharge, 23,300 second-feet Dec. 23, 1933 (gage height, 17.72 feet, present datum).

Remarks.- Oswego Canal diverts water  $4\frac{1}{2}$  miles above station, average diversion being 72 second-feet in May, 73 second-feet in June, and 69 second-feet in July (included in monthly values below).

Mean discharge, in second-feet, 1948

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,420	888	179	11	3,070	398	176	21	1,470	329	94
2	1,310	838	167	12	2,840	398	164	22	1,390	344	90
3	1,370	794	159	13	2,590	410	150	23	1,270	336	90
4	1,700	734	159	14	2,290	410	139	24	1,170	301	90
5	2,140	695	157	15	2,080	386	127	25	1,100	278	88
6	2,760	645	162	16	1,910	366	111	26	1,050	259	87
7	3,220	425	174	17	1,800	347	106	27	993	243	85
8	3,410	378	184	18	1,730	329	102	28	981	234	83
9	3,360	418	186	19	1,640	318	97	29	1,020	225	82
10	3,240	410	184	20	1,540	315	94	30	1,060	200	80
								31	975		78
Monthly mean discharge, in second-feet									1,940	494	196
Runoff, in inches									3.15	0.78	0.32



## Clackamas River near Cazadero, Oreg.

Location.- Lat. 45°14', long. 122°16', in NE¼ sec. 11, T. 4 S., R. 4 E., half a mile upstream from backwater from Cazadero Dam of Portland General Electric Co., and 3 miles southeast of Cazadero. Datum of gage is 532.0 feet above mean sea level (levels by Portland General Electric Co.); gage readings have been reduced to elevations above mean sea level.

Drainage area.- 665 square miles.

Gage-height record.- Water-stage recorder graph, adjusted May 3 because of sluggish inlet condition on basis of outside gage reading

Discharge record.- Stage-discharge relation defined by current-meter measurements below 23,400 second-feet, and extended on basis of computation of flow over dam.

Maxima.- May-June 1948: Discharge, 7,400 second-feet May 3, computed on basis of records for Clackamas River above Three Lynx Creek.

1909 to April 1948: Discharge, 60,800 second-feet Mar. 31, 1931 (elevation, 556.5 feet).

Remarks.- Some diurnal fluctuation due to Oak Grove power plant.

Mean discharge, in second-feet, 1948

mean discharge, in second-feet, 1940											
Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2,680	4,140	1,710	11	3,540	3,450	1,430	21	3,270	2,630	1,270
2	2,540	4,060	1,660	12	3,560	3,350	1,400	22	3,360	2,620	1,240
3	3,730	4,240	1,610	13	3,640	3,110	1,370	23	3,460	2,400	1,240
4	6,290	3,990	1,570	14	3,650	2,900	1,340	24	3,700	2,220	1,230
5	5,470	3,600	1,550	15	3,400	2,660	1,320	25	4,390	2,100	1,200
6	5,560	3,470	1,580	16	3,560	2,560	1,300	26	5,030	2,010	1,180
7	5,840	3,600	1,600	17	3,490	2,440	1,290	27	5,420	1,940	1,200
8	5,110	3,690	1,560	18	3,560	2,300	1,280	28	5,800	1,890	1,320
9	4,420	3,590	1,500	19	3,420	2,210	1,290	29	5,470	1,830	1,300
10	3,880	3,340	1,450	20	3,280	2,170	1,290	30	4,800	1,760	1,240
								31	4,290		1,180
Monthly mean discharge, in second-feet.....									4,168	2,876	1,378
Runoff, in inches.....									7.23	4.82	2.39

## Johnson Creek at Sycamore, Oreg.

Location.- Lat. 45°28'40", long. 122°30'30", in lot 2, SW¼ sec. 13, T. 1 S., R. 2 E., a third of a mile southwest of Sycamore station. Datum of gage is 228.03 feet above mean sea level, datum of 1929.

Drainage area.- 28.2 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements below 1,100 second-feet.

Maxima.- May-June 1948: Discharge, 336 second-feet 6:30 a.m. May 6 (gage height, 5.12 feet).

1940 to April 1948: Discharge, 1,820 second-feet Jan. 7, 1948 (gage height, 13.06 feet).

Remarks.- Small diversions above station for irrigation; no regulation.

Mean discharge, in second-feet, 1948

mean discharge, in second-feet, 1940											
Day	May	June	July	Day	May	June	July	Day	May	June	July
1	34	14	4.0	11	50	13	4.0	21	19	9.9	3.6
2	30	12	4.0	12	52	9.9	4.0	22	17	7.8	3.6
3	106	11	4.0	13	52	9.4	4.0	23	15	7.4	3.8
4	91	11	4.0	14	44	8.2	3.8	24	13	6.6	3.6
5	231	10	4.0	15	37	7.4	3.8	25	12	5.7	3.4
6	278	9.0	4.5	16	32	7.0	3.8	26	11	5.3	3.1
7	156	8.2	5.3	17	29	6.6	3.6	27	12	5.3	4.0
8	106	7.0	4.9	18	24	6.6	3.6	28	46	4.9	4.0
9	80	6.6	4.3	19	23	5.7	3.6	29	29	4.5	4.0
10	62	6.6	4.0	20	23	7.4	3.6	30	20	4.0	3.8
								31	15		3.6
Monthly mean discharge, in second-feet.....									56.4	7.93	3.91
Runoff, in inches.....									2.31	0.31	0.16

Lewis River BasinLewis River near Ariel, Wash.

Location.- Lat. 45°57'10", long. 122°33'45", in NW¼NE¼ sec. 4, T. 5 N., R. 2 E., at Ariel, half a mile downstream from Ariel Dam and power plant and 3 miles upstream from Cedar Creek. Datum of gage is 44 feet above mean sea level, unadjusted (levels by Northwestern Electric Co.).

Drainage area.- 731 square miles.

Gage-height record.- Water-stage recorder graph except period 10 p.m. June 11 to noon June 22, when there was no gage-height record.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Gage heights used to hundredths. Discharges for period of no gage-height record computed on basis of power-plant records.

Maxima.- May-June 1948: Discharge, 16,500 second-feet 7 p.m. May 6 (gage height, 10.12 feet).

1909, 1922 to April 1948: Discharge, 129,000 second-feet Dec. 22, 1933 (gage height, 35.0 feet, from floodmarks).

Remarks.- No diversions. Flow regulated by Lake Merwin Reservoir on Lewis River, lat. 45°57'30", long. 122°33'10", in SW¼ sec. 34, T. 6 N., R. 2 E., at Ariel, completed in 1931; usable storage, 246,000 acre-feet between elevations 165 feet (set by Federal Power Commission) and 235 feet (spillway crest) above mean sea level. Water is used for power. Figures of discharge not corrected for change in contents of Lake Merwin. Gage-height record collected in cooperation with Pacific Power & Light Co.

*Mean discharge, in second-feet, 1948*

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	4,630	6,750	3,470	11	6,890	5,020	671	21	6,450	4,500	2,110
2	4,360	6,740	3,450	12	6,680	6,890	2,270	22	7,100	3,890	2,110
3	7,260	7,690	3,260	13	7,260	6,100	2,120	23	6,920	3,910	1,650
4	8,860	6,920	1,780	14	7,330	5,450	2,010	24	7,540	3,420	694
5	9,960	6,590	972	15	6,730	4,800	1,730	25	8,650	3,410	646
6	14,500	6,880	2,600	16	6,680	5,270	2,070	26	9,750	3,380	2,040
7	14,600	7,200	2,480	17	6,790	4,910	1,480	27	10,000	3,250	1,500
8	11,000	7,420	2,750	18	6,700	4,410	655	28	10,000	2,550	1,960
9	9,120	7,230	3,610	19	6,400	3,890	2,110	29	8,690	2,380	1,810
10	7,480	6,840	2,500	20	6,230	4,310	2,120	30	7,350	2,990	1,980
								31	6,870		1,090
Monthly mean discharge, in second-feet.....									8,032	5,160	1,990
Runoff, in inches.....									12.67	7.88	3.14

East Fork Lewis River near Heisson, Wash.

Location.- Lat. 45°50', long. 122°28', in N½ sec. 17, T. 4 N., R. 3 E., just upstream from Basket Creek, 1½ miles northeast of Heisson, and 20 miles upstream from mouth. Datum of gage is 366.8 feet above mean sea level (from river-profile surveys).

Drainage area.- 125 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Gage heights used to half-tenths between 2.4 and 6.1 feet; hundredths below and tenths above these limits. Shifting-control method used July 6-31.

Maxima.- May-June 1948: Discharge, 3,330 second-feet 6 a.m. May 6 (gage height, 6.09 feet).

1929-48: Discharge, 15,600 second-feet Dec. 22, 1933 (gage height, 12.3 feet), from rating curve extended above 12,000 second-feet.

Remarks.- No diversion or regulation.

*Mean discharge, in second-feet, 1948*

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	590	427	159	11	935	314	130	21	652	335	110
2	570	400	154	12	960	272	124	22	610	308	104
3	1,830	390	147	13	1,010	272	118	23	550	275	101
4	1,920	357	142	14	935	235	113	24	570	249	97
5	2,060	332	147	15	835	217	109	25	590	230	92
6	2,950	320	168	16	860	208	105	26	550	217	89
7	2,290	305	174	17	835	198	104	27	530	204	133
8	1,680	288	155	18	720	189	105	28	698	189	166
9	1,320	267	136	19	675	183	115	29	530	176	132
10	1,070	249	135	20	630	254	117	30	466	164	114
								31	444		103
Monthly mean discharge, in second-feet.....									996	267	126
Runoff, in inches.....									9.18	2.39	1.16

Kalama River Basin

Kalama River below Italian Creek, near Kalama, Wash.

Location.- Lat. 46°02'30", long. 122°49'00", in NE $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 33, T. 7 N., R. 1 W., 2 $\frac{1}{2}$  miles northeast of Kalama and 4 miles above mouth.Drainage area.- 195 square miles.Gage-height record.- Staff gage read twice daily.Discharge record.- Stage-discharge relation defined by current-meter measurements.Maxima.- May-June 1948: Discharge observed, 5,340 second-feet 6 p.m. May 6 (gage height, 7.84 feet).

1946 to April 1948: Discharge observed, 14,400 second-feet Dec. 13, 1946, gage height, 13.40 feet), from rating curve extended above 6,670 second-feet.

Remarks.- Negligible amount of diversion above station.*Mean discharge, in second-feet, 1948*

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,070	1,000	498	11	1,570	821	426	21	1,420	763	382
2	1,000	1,000	474	12	1,570	763	404	22	1,340	707	359
3	1,490	1,000	474	13	1,730	763	404	23	1,270	652	359
4	2,060	881	450	14	1,810	652	404	24	1,270	626	359
5	2,700	881	450	15	1,650	626	404	25	1,420	599	338
6	4,820	881	498	16	1,570	599	382	26	1,420	574	338
7	3,860	881	523	17	1,490	599	382	27	1,340	548	404
8	2,600	881	474	18	1,420	574	382	28	1,490	523	404
9	2,060	821	450	19	1,340	574	382	29	1,270	523	382
10	1,730	707	450	20	1,340	652	382	30	1,140	498	359
								31	1,070		338
Monthly mean discharge, in second-feet.....									1,720	719	410
Runoff, in inches.....									10.17	4.11	2.42

Cowlitz River Basin

Cowlitz River at Castle Rock, Wash.

Location.- Lat. 46°16'30", long. 122°55'00", in SE $\frac{1}{4}$  sec. 10, T. 9 N., R. 2 W., at highway bridge in Castle Rock, 2 $\frac{1}{2}$  miles downstream from Toutle River and 14 miles upstream from mouth. Datum of gage is 19.73 feet above mean sea level, datum of 1929.Drainage area.- 2,240 square miles.Gage-height record.- Water-stage recorder graph.Discharge record.- Stage-discharge relation defined by current-meter measurements.

Gage heights used to hundredths.

Maxima.- May-June 1948: Discharge, 30,000 second-feet 5 to 6 p.m. May 28 (gage height, 15.56 feet).

1926 to April 1948: Discharge observed, 139,000 second-feet Dec. 23, 1933 (gage height, 31.6 feet, present datum).

Remarks.- No diversion or regulation.*Mean discharge, in second-feet, 1948*

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	8,030	16,900	9,600	11	13,900	20,200	5,440	21	13,900	13,400	4,550
2	7,450	17,600	8,320	12	13,100	20,900	5,390	22	16,100	13,800	4,420
3	8,970	19,300	7,360	13	14,000	17,900	5,010	23	16,900	12,000	4,260
4	12,600	19,900	7,030	14	14,500	15,800	4,960	24	16,500	11,000	4,230
5	15,400	17,700	6,720	15	13,400	13,900	4,880	25	19,100	10,500	3,950
6	23,000	17,900	6,270	16	12,700	12,900	4,800	26	23,100	10,000	3,770
7	28,800	19,800	6,550	17	13,100	14,300	4,740	27	26,000	9,750	3,950
8	24,000	21,400	6,330	18	13,500	12,900	4,770	28	29,300	9,720	4,690
9	19,100	21,600	5,500	19	13,000	11,600	4,980	29	27,000	9,900	4,360
10	16,100	20,900	5,440	20	12,900	11,700	4,740	30	21,400	10,200	3,920
								31	17,400		3,790
Monthly mean discharge, in second-feet.....									16,910	15,180	5,314
Runoff, in inches.....									8.70	7.56	2.73

Elokomin River Basin

Elokomin River near Cathlamet, Wash.

Location.- Lat. 46°13'10", long. 123°20'30", in SE $\frac{1}{4}$  sec. 31, T. 9 N., R. 5 W., 2 miles northeast of Cathlamet and 4 miles upstream from mouth. Datum of gage is 29.60 feet above mean sea level, datum of 1929.

Drainage area.- 66 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Gage heights used to hundredths below and half-tenths above 3.9 feet. Shifting-control method used June 1 to July 31.

Maxima.- May-June 1948: Discharge, 1,630 second-feet 2:30 a.m. May 6 (gage height, 6.20 feet).

1940 to April 1948: Discharge, 6,210 second-feet Jan. 25, 1947 (gage height, 10.76 feet).

Maximum stage known, 17.2 feet in December 1933, from information by local residents.

Remarks.- No diversion or regulation.

*Mean discharge, in second-feet, 1948*

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	277	163	69	11	408	120	60	21	274	115	51
2	261	156	68	12	424	118	58	22	256	100	47
3	506	152	68	13	441	113	57	23	241	94	47
4	566	148	64	14	398	109	56	24	226	91	44
5	844	142	68	15	370	105	53	25	214	86	43
6	1,410	134	75	16	382	102	50	26	203	84	43
7	938	150	74	17	367	98	49	27	200	82	57
8	710	124	74	18	328	98	49	28	241	77	53
9	566	120	66	19	308	96	53	29	203	74	47
10	475	118	62	20	310	115	54	30	182	70	43
								31	176		41
Monthly mean discharge, in second-feet.....									410	111	56.2
Runoff, in inches.....									7.16	1.88	0.98

Youngs River Basin

Youngs River near Astoria, Oreg.

Location.- Lat. 46°04', long. 123°47', in NW $\frac{1}{4}$  sec. 27, T. 7 N., R. 9 W., 50 feet upstream from crest of Youngs River Falls,  $2\frac{1}{2}$  miles southwest of Olney, and 9 miles southeast of Astoria. Datum of gage is 62.64 feet above mean sea level, datum of 1929.

Drainage area.- 32 square miles.

Gage-height record.- Water-stage recorder graph.

Discharge record.- Stage-discharge relation defined by current-meter measurements.

Maxima.- May-June 1948: Discharge, 708 second-feet 1:30 a.m. May 6 (gage height, 5.96 feet).

1927 to April 1948: Discharge, 6,300 second-feet Nov. 24, 1927 (gage height, 6.52 feet, site and datum then in use), from rating curve extended above 2,000 second-feet.

Remarks.- No diversion or regulation above station.

*Mean discharge, in second-feet, 1948*

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	142	51	15	11	160	29	12	21	113	48	12
2	128	48	15	12	173	29	12	22	101	33	11
3	288	45	15	13	236	28	11	23	93	27	11
4	285	44	15	14	271	28	11	24	84	24	9.8
5	470	42	15	15	217	27	11	25	79	24	9.3
6	582	38	15	16	190	25	10	26	75	23	9.1
7	412	34	15	17	165	25	10	27	70	22	16
8	307	33	15	18	142	24	11	28	81	20	15
9	232	31	14	19	128	23	12	29	69	18	13
10	188	30	13	20	132	36	13	30	61	16	11
								31	55		9.8
Monthly mean discharge, in second-feet.....									184	30.8	12.5
Runoff, in inches.....									6.63	1.08	0.45

## SUMMARY OF FLOOD STAGES AND DISCHARGES

The results of the determinations of maximum flood flows at existing stream-gaging stations and other places on streams in the area covered by this report are summarized and presented in table 3, "Summary of flood stages and discharges." The time of day in this table is for standard time. The map reference number in this table is applicable to plate 6 (in pocket) and will aid in identifying the place where the discharge was determined.

The discharges for the existing stream-gaging stations were determined by methods described in greater detail in the presentation of the record for the respective stations in the section "Stages and discharges at stream-gaging stations." For existing stream-gaging stations the method of determination is designated "Stage-discharge relation," because the determination is based on the comprehensive studies of that subject that are conducted at such stations. Where the recorded discharge was not measured at a regular station a brief reference is generally made to the method of determination.

At some places pertinent information regarding stages antedating the period of record of discharge is shown by a footnote. Explanatory footnotes on other features of the table are also included.

Figure 19 shows the flood discharges, in second-feet per square mile, which are listed in table 3, plotted against the corresponding drainage areas. In this connection it should be understood that except for a small number of items as indicated in the table the discharges are given as observed and many are affected by artificial storage, release of water resulting from failure of dams, or other similar factors, on which available information is presented in the preceding section, "Stages and discharges at stream-gaging stations during the flood period."

The basic data and computations for the determinations of discharge are filed in the district offices of the Geological Survey in the several districts where the floods occurred and may be examined in those offices.

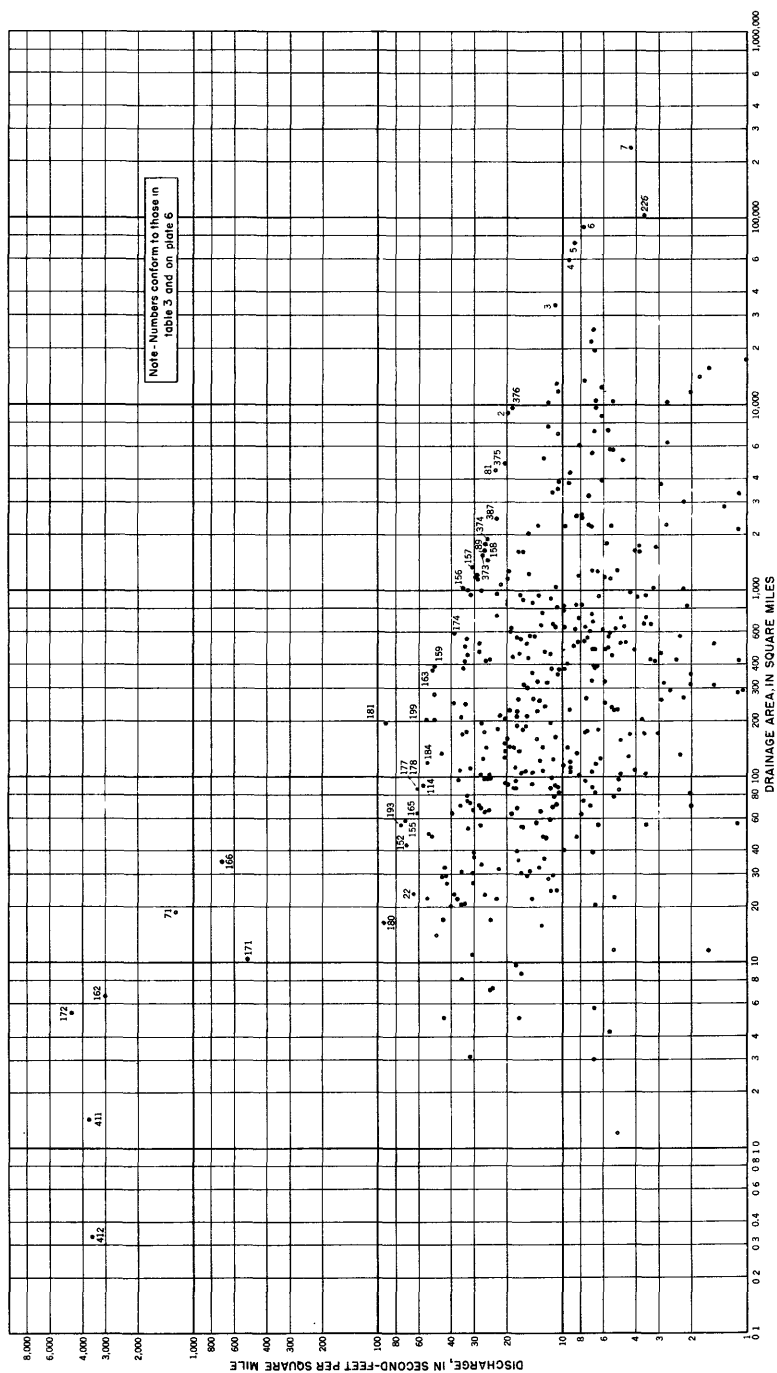


Figure 19.--Maximum discharges, in second-feet per square mile, for various areas in Columbia River Basin, May-June 1948, as given in table 3.

Table 3.-Summary of flood stages and discharges

No. on map	Stream and place of determination	Drainage area (sq.mi.)	Period of record	Maximum previously known			Maximum during May-June 1948					
				Date	Stage height (feet)	Discharge (sec.-ft.)	Sec.-ft. per sq. mi.	Date and hour	Stage height (feet)	Discharge (sec.-ft.)	Sec.-ft. per sq. mi.	Method of determination
COLUMBIA RIVER MAIN STEM												
1	Columbia River at Nicholson, B. C.	22,490	1903-48	June 25, 1916	212.50	23,700	9.52	June 11	13.60	19,400	7.79	
2	Columbia River at Revelstoke, B. C.	9,000	1911-22, 1928-48	July 18, 1920	221.1	6171,000	19.00	June 9	22.49	178,000	19.78	
3	Columbia River at Birchbank, B. C.	34,000	1913-48	June 14, 1915	241.6	312,000	9.18	4 p.m. June 11	50.62	370,000	10.88	
4	Columbia River at International boundary	59,700	1938-48	June 6, 1946	1,226.08	360,200	-	6 a.m. June 12	246.17	550,100	9.21	
5	Columbia River at Grand Coulee Dam, Wash.	74,100	1913-48	June 1894	-	725,000	-	6 a.m. June 12	87.90	637,800	8.61	
6	Columbia River at Trinidad, Wash.	89,700	1913-48	June 7, 1894	-	740,000	-	10:30 p.m. June 12	59.35	692,600	7.72	
7	Columbia River near The Dalles, Oreg.	237,000	1876-1948	June 6, 1894	160.1	1,240,000	5.23	1:30, 3, 6:30 p.m. May 31	194.56	1,010,000	4.26	
KOOTENAI RIVER BASIN												
8	Kootenay River at Canal Flats, B. C.	2,040	1939-48	May 29, 1946	7.10	22,800	9.51	May 24	8.10	31,300	15.34	
9	Kootenay River at Vardner, B. C.	5,200	1914-48	June 21, 1916	14.3	67,500	12.98	Moon May 29	13.17	65,000	12.50	
10	Kootenay River at Wagate, B. C.	7,660	1930-48	June 18, 1933	12.30	80,000	10.44	10:30 a.m. May 28	15.00	91,900	12.00	
11	Kootenai River at Libby, Mont.	10,240	1910-48	June 21, 1916	20.7	130,000	12.7	10 a.m. May 28	19.93	122,000	11.9	Stage-discharge relation
12	Kootenai River at Leonia, Idaho	11,740	1928-48	June 18, 1933	216.11	95,500	8.1	1:30 a.m. May 28	23.40	123,000	10.5	
13	Kootenai River at Boon Camp, near Bonners Ferry, Idaho	-	1927-48	June 18, 1933	21,776.58	-	-	8 p.m. May 28	21,779.87	-	-	
14	Kootenai River at Bonners Ferry, Idaho	13,000	1927-48	June 18, 1933	(g)	699,800	-	6 p.m. May 27	(1)	139,000	10.7	
15	Kootenai River near Bonners Ferry, Idaho	13,000	1928-48	June 20, 1933	21,774.17	-	-	6:30 p.m. May 28	21,776.24	-	-	
16	Kootenai River at Klockmann Ranch, near Bonners Ferry, Idaho	-	1928-48	June 20, 1933	21,771.24	-	-	8 p.m. May 28	21,773.82	-	-	
17	Kootenai River near Copeland, Idaho	13,400	1929-48	June 19, 1933	(j)	690,500	-	5 a.m. May 31	21,770.10	-	-	
18	Kootenai River at Fort Hall, Idaho	13,700	1928-48	June 19, 1933	(k)	693,200	-	1:30 a.m. May 31	21,766.16	-	-	
19	Fortias Creek near Trego, Mont.	111	1947-48	Apr. 29, 1947	210.28	962	8.67	May 22	10.46	1,000	9.01	Stage-discharge relation
20	Tobacco River near Buraba, Mont.	495	-	-	-	-	-	-	-	2,810	5.79	Slope area

21	Fisher River near Jennings, Mont.	840	-	-	-	-	-	-	6,560	7.81	Slope area
22	Granite Creek near Libby, Mont.	23.6	1933	Apr. 18, 1938	4.40	1,960	83.1	-	1,520	64.4	Do.
23	Flower Creek at Libby, Mont.	20.5	-	-	-	-	-	-	720	35.1	Contracted-opening
24	Lake Creek at Troy, Mont.	211	1945-46	May 9, 1947	6.48	2,400	11.4	2 a.m. May 30	3,250	15.4	Stage-discharge relation
25	Yank River near Troy, Mont.	559	1910-16	May 15, 1912	53.69	4,240	7.56	-	9,850	17.6	Slope area
26	Boulder Creek near Leona, Idaho	53	1928-48	Oct. 19, 1947	7.85	2,700	50.9	9 p.m. May 27	1,710	32.3	Contracted-opening
27	Moyie River at Eastport, Idaho	570	1929-48	May 10, 1947	-	6,800	11.9	11 p.m. May 24	8,030	14.1	
28	Moyie River at Elleen, Idaho	755	1925-48	Apr. 29, 1934	-	8,780	11.6	4 a.m. May 26	9,650	12.8	
29	Deep Creek at Moravia, Idaho	133	1928-48	Dec. 22, 1933	-	1,300	9.8	2:30 p.m. May 24	1,110	8.3	
30	Mission Creek at Copeland, Idaho	31	1928-34	May 22, 1932	-	370	11.9	May 20	450	15.0	Dam and orifice; slope area
31	Long Canyon Creek near Porthill, Idaho	29	1928-48	June 15, 1933	-	1950	32.8	May 26 or 27	21,300	14.8	Slope area
32	Smith Creek near Porthill, Idaho	70	1928-48	May 17, 1941	7.36	3,150	45.0	9 p.m. May 27	2,460	35.4	
33	Boundary Creek near Porthill, Idaho	97	1928-48	June 15, 1933	5.22	2,400	24.7	12:30 a.m. May 28	2,530	26.1	
34	Slocan River near Crescent Valley, B. C.	1,270	1913-15 1925-48	May 28, 1928	-	24,000	18.9	4 p.m. June 10	24,700	13.4	
PAND OSEILLE RIVER BASIN											
35	Clark Fork near Garrison, Mont.	1,610	-	-	-	-	-	-	6,130	3.81	Slope area
36	Clark Fork above Missoula, Mont.	5,740	1929-48	May 9, 1947	11.10	24,200	4.22	3 p.m. May 23	31,500	5.49	Stage-discharge relation
37	Clark Fork below Missoula, Mont.	8,690	1929-48	May 10, 1947	11.18	45,900	5.28	6 to 7 p.m. May 23	52,800	6.08	Do.
38	Clark Fork at Tarkio, Mont.	9,630	1944-48	May 10, 1947	27.60	57,200	5.94	12 p.m. May 30	63,200	6.56	Do.
39	Clark Fork at St. Regis, Mont.	10,500	1910-23 1925-48	May 30, 31, 1913	19.1	62,800	5.98	1000 May 24	68,900	6.56	Do.

j Elevation of 1,767.98 feet occurred June 20, 1933.  
 k Maximum elevation known, 1,772.7 feet sometime in June 1894. Elevation of 1,764.08 feet occurred May 31, 1935.

m From floodmark.  
 n Site and datum then in use.  
 o Staff-gage reading.  
 q At State Highway 1, drainage area, 30 square miles.  
 r Estimated maximum daily discharge.  
 s May have been affected by release from drift jam.  
 t 1926-31 at Shoreside, drainage area, 1,500 square miles.  
 u Affected by regulation.  
 v Outside gage reading.

a 1903-29 at site at Golden; drainage area, 2,500 square miles.  
 b Flood of June 1894 reached a stage of 23.55 feet, discharge 215,000 second-feet.  
 c 1913-37 at site at Trail about 2 miles downstream; drainage area, 34,000 square miles.

d Gage height at site at Trail.  
 e Flood of June 1894 reached an elevation of 1,824.6 feet, from information by  
 by Great Northern Railway Co.  
 f Elevation above mean sea level.  
 g Flood of June 1894 reached an elevation of 1,777.2 feet and that of June 18,  
 1933, 1,774.98 feet.  
 h Mean daily discharge.  
 i Maximum elevation, 1,776.32 feet 7 p.m. May 28.



Table 3.- Summary of flood stages and discharges--Continued

No. on map	Stream and place of determination	Drainage area (sq.mi.)	Period of record	Maximum previously known			Maximum during May-June 1948					
				Date	Stage height (feet)	Discharge (sec.-ft.)	Sec.-ft. per sq. mi.	Date and hour	Stage height (feet)	Discharge (sec.-ft.)	Sec.-ft. per sq. mi.	Method of determination
POND OREILLE RIVER BASIN--Continued												
40	Clark Fork near Plains, Mont.	19,900	1910-48	May 28, 1928	18.4	126,000	6.33	1:30 p.m. June 5	19.17	134,000	6.73	Stage-discharge relation
41	Clark Fork near Heron, Mont.	21,800	1928-48	June 1894	59.1	195,000	8.9	1 a.m. May 31	450.97	153,000	7.0	
42	Pond Oreille River below 2 Canyon, near Metaline Falls, Wash.	25,200	1908-10 1912-48	June 16, 1913	41.2	139,000	-	3:30 p.m. June 13	60.25	171,300	6.80	
43	Little Blackfoot River near Garrison, Mont.	407	-	-	-	-	-	-	-	1,260	3.10	Slope area
44	Flint Creek near Southern Cross, Mont.	52.5	1940-48	June 13, 1942	41.86	162	-	June 4 to July 6	41.78	146	-	Stage-discharge relation
45	Flint Creek at Maxville, Mont.	208	1941-48	Mar. 28, 1943	46.79	1,660	-	2 p.m. June 4	45.25	928	-	Do.
46	Flint Creek near Maxville, Mont.	324	1946-48	June 10, 1947	3.90	580	-	9 a.m. June 4	6.39	1,700	-	Do.
47	Flint Creek near Drummond, Mont.	492	1946-48	June 10, 1947	25.10	-	-	June 3	11.15	1,800	-	Do.
48	Trout Creek above main canal near Phillipsburg, Mont.	4.2	1945-48	Apr. 14, 1947	1.97	26	6.19	6 a.m. May 20, and June 4	1.90	23	5.48	Do.
49	Trout Creek near Southern Cross, Mont.	34.8	1945-48	Apr. 16, 1948	5.67	331	-	10 a.m. June 23	44.18	124	-	Do.
50	Boulder Creek at Maxville, Mont.	71.3	1935-48	May 26, 1942	4.04	650	9.12	5 p.m. June 3	4.24	763	10.7	Do.
51	Willow Creek near Hall, Mont.	102	1945-48	Apr. 22, 1947	2.83	75	-	5 p.m. May 29	3.88	163	-	Do.
52	Middle Fork Rock Creek near Phillipsburg, Mont.	123	1937-48	10 a.m. May 9, 1947	3.60	1,230	10.0	6:15 p.m. May 29	3.80	1,360	11.1	Slope area and stage-discharge relation
53	Rock Creek near Quigley, Mont.	748	1911-12 1922-27	June 5, 1922	6.38	6,680	8.85	-	-	5,140	6.87	Slope area
54	Blackfoot River near Helmsville, Mont.	461	1940-48	June 15, 1943	7.33	3,080	6.40	4 a.m. June 6	7.55	3,180	6.61	Slope area and stage-discharge relation
55	Blackfoot River near Orando, Mont.	1,280	1940-48	June 20, 1943	6.26	6,950	5.43	10 a.m. May 22	6.44	8,200	6.41	Do.
56	Blackfoot River near Bonner, Mont.	2,280	1939-48	May 9, 1947	9.90	12,800	5.61	10 a.m. May 22	41.13	16,300	7.15	Stage-discharge relation
57	Nevada Creek above reservoir near Flinn, Mont.	128	1939-48	Apr. 16, 1948	6.04	1,440	11.2	2 p.m. May 22	4.22	557	4.35	Do.
58	Nevada Creek near Helmsville, Mont.	165	1946-48	June 13, 1947	44.22	260	-	May 22	44.63	470	-	Do.
60	North Fork Blackfoot River near Orando, Mont.	227	1921-23	June 5, 1922	7.56	2,900	12.8	-	m9.0	4,380	19.3	Slope area

### SUMMARY OF FLOOD STAGES AND DISCHARGES

283

Station	Date	Time	Wind	Temp	Humidity	Pressure	Clouds	Visibility	Remarks
1. Clearwater River at Clearwater, Mont.	May 12, 26, 1922	6.12	10	58	75	30.1	100	10	Clear
2. Battlemake Creek at Missoula, Mont.	May 18, 1899	6.25	10	58	75	30.1	100	10	Clear
3. West Fork Bitterroot River near Conner, Mont.	May 9, 1947	6.17	10	58	75	30.1	100	10	Clear
4. Bitterroot River near Darcy, Mont.	May 9, 1947	6.16	10	58	75	30.1	100	10	Clear
5. East Fork Bitterroot River at Conner, Mont.	May 9, 1947	5.78	10	58	75	30.1	100	10	Clear
6. Rock Creek near Darcy, Mont.	May 10, July 4-10, 1946	4.10	10	58	75	30.1	100	10	Clear
7. Lost Horse Creek near Hamilton, Mont.	June 14, 1922	3.80	10	58	75	30.1	100	10	Clear
8. Skullaho Creek near Hamilton, Mont.	May 9, 1947	6.10	10	58	75	30.1	100	10	Clear
9. Blodgett Creek near Corvallis, Mont.	May 9, 1947	6.10	10	58	75	30.1	100	10	Clear
10. Fred Burr Creek near Victor, Mont.	Apr. 18, 1938	3.45	10	58	75	30.1	100	10	Clear
11. Bear Creek near Victor, Mont.	May 28, 1938	2.92	10	58	75	30.1	100	10	Clear
12. Kootenai Creek near Stevensville, Mont.	May 28, 1938	2.92	10	58	75	30.1	100	10	Clear
13. Burnt Fork Creek near Stevensville, Mont.	May 28, 1938	2.92	10	58	75	30.1	100	10	Clear
14. Lolo Creek near Lolo, Mont.	May 28, 1913	5.2	10	58	75	30.1	100	10	Clear
15. Minemile Creek near Minemile, Mont.	May 28, 1913	5.2	10	58	75	30.1	100	10	Clear
16. Fish Creek near Tarkio, Mont.	May 28, 1917	5.65	10	58	75	30.1	100	10	Clear
17. St. Regis River near St. Regis, Mont.	May 28, 1917	5.65	10	58	75	30.1	100	10	Clear
18. Flathead River at Flathead, B. C.	June 20, 1916	5.8	10	58	75	30.1	100	10	Clear
19. Flathead River near Columbia Falls, Mont.	June 20, 1916	5.8	10	58	75	30.1	100	10	Clear
20. Flathead River at Columbia Falls, Mont.	June 20, 1916	5.8	10	58	75	30.1	100	10	Clear
21. Flathead River near Polson, Mont.	June 20, 1916	5.8	10	58	75	30.1	100	10	Clear
22. Middle Fork Flathead River at Conner, Mont.	June 20, 1916	5.8	10	58	75	30.1	100	10	Clear
23. Middle Fork Flathead River at Belton, Mont.	June 20, 1916	5.8	10	58	75	30.1	100	10	Clear
24. Middle Fork Flathead River near Belton, Mont.	June 20, 1916	5.8	10	58	75	30.1	100	10	Clear
25. Bear Creek near Essex, Mont.	May 2, 1947	2.87	10	58	75	30.1	100	10	Clear

m From floodmark.  
n Site and datum then in use.  
u Affected by regulation.

Table 3.-Summary of flood stages and discharges --Continued

No. on map	Stream and place of determination	Drainage area (sq. mi.)	Period of record	Maximum previously known			Maximum during May-June 1948					
				Date	Gage height (feet)	Discharge (sec.-ft.)	Sec.-ft. per sq. mi.	Date and hour	Gage height (feet)	Discharge (sec.-ft.)	Sec.-ft. per sq. mi.	Method of determination
PMD OMBILLA RIVER BASIN—Continued												
87	Skyland Creek near Essex, Mont.	8.09	1946-48	3 to 6 a.m. May 9, 1947	1.84	189	23.4	1 p.m. May 22	2.15	284	35.1	Stage discharge relation
88	South Fork Flathead River near Hungry Horse, Mont.	959	-	-	-	-	-	-	-	22,000	22.9	Slope area
89	South Fork Flathead River near Columbia Falls, Mont.	1,640	1910-16, 1923-48	June 19, 1916	416.6	46,200	28.2	12 p.m. May 22	419.60	43,400	26.5	Stage-discharge relation
90	Spotted Bear River near Hungry Horse, Mont.	180	-	-	-	-	-	-	-	4,010	22.3	Slope area
91	Twin Creek near Hungry Horse, Mont.	47.6	-	-	-	-	-	-	-	2,410	50.6	Do.
92	Lower Twin Creek near Hungry Horse, Mont.	22.2	-	-	-	-	-	-	-	1,200	54.1	Do.
93	Sullivan Creek near Hungry Horse, Mont.	72.7	-	-	-	-	-	-	-	2,280	31.4	Do.
94	Graves Creek near Hungry Horse, Mont.	33.0	-	-	-	-	-	-	-	1,440	43.6	Do.
95	Stillwater River near Whitefish, Mont.	529	1930-48	10 p.m. May 12, 1947	17.22	3,200	6.05	4 p.m. May 26	20.90	4,330	8.19	Stage-discharge relation
96	Whitefish Creek near Kalispell, Mont.	173	1928-48	June 3, 1932	4.26	1,260	7.28	8 p.m. May 30	4.41	1,290	7.46	Do.
97	Ashley Creek near Kalispell, Mont.	203	1931-48	5:50 p.m. May 12, 1947	6.26	365	1.80	12 p.m. May 27	7.58	749	3.69	Do.
98	Swan River at Bumble Creek, Mont.	144	-	-	-	-	-	-	-	1,350	9.38	Slope area
99	Swan River near Big Fork, Mont.	647	1922-48	June 18, 1933	7.00	8,280	12.8	8 a.m. to 4 p.m. May 24	7.12	8,400	13.0	Stage-discharge relation
100	Big Creek near Folsom, Mont.	5.0	1917-32	June 9, 1917	-	104	20.8	-	-	85	17.0	Contracted-opening
101	North Crow Creek near Bonan, Mont. $\frac{5}{3}$	11	-	-	-	-	-	May 27	-	338	30.7	-
102	Crow Creek near Bonan, Mont. $\frac{5}{3}$	65	-	-	-	-	-	May 28	-	848	13.0	-
103	Middle Crow Creek near Bonan, Mont. $\frac{5}{3}$	3.1	-	-	-	-	-	May 28	-	97	31.3	-
104	South Crow Creek near Bonan, Mont. $\frac{5}{3}$	7.1	-	-	-	-	-	May 28	-	175	24.6	-
105	Mission Creek near St. Ignatius, Mont. $\frac{5}{3}$	14	-	-	-	-	-	May 28	-	670	47.9	-
106	Foot Creek near Charlo, Mont. $\frac{5}{3}$	22	-	-	-	-	-	May 28	-	508	23.1	-
107	North LaBore Creek near Charlo, Mont. $\frac{5}{3}$	3.0	-	-	-	-	-	May 28	-	20	6.67	-
108	South LaBore Creek near Charlo, Mont. $\frac{5}{3}$	1.2	-	-	-	-	-	May 28	-	6	5.0	-

No.	Location	Date	Time	Area	Remarks	Area	Remarks	Area	Remarks
144	Jocko River near Jocko, Mont.	-	-	-	-	-	-	2,660	18.5
351	Jocko River near Ravalli, Mont. <u>g</u>	-	-	-	-	-	-	3,700	10.5
638	Thompson River near Thompson Falls, Mont.	1911-12	May 6, 1911	5.80	1,690	2.65	May 27	6,190	9.70
415	Prospect Creek at Thompson Falls, Mont.	1911-12	Mar. 23, 1911	6.1	1,250	8.62	-	2,800	19.3
137	Bull River near Hoxon, Mont.	-	-	-	-	-	-	2,790	20.4
90	Lightning Creek near Morris Creek, near Clark Fork, Idaho	-	-	-	-	-	-	5,100	56.7
572	Priest River at outlet of Priest Lake, near Coolin, Idaho	1911-12	May 30, 1917	6.83	7,290	12.7	Probably May 27 or 28 4 to 10 p.m.	8,560	15.0
902	Priest River near Priest River, Idaho	1903-5	May 23, 1932	8.03	8,890	9.9	May 29 10 a.m. May 29 to 10 a.m. May 30	10,500	11.6
20	Indian Creek at mouth, near Coolin, Idaho	-	-	-	-	-	Probably May 27 or 28	800	40.0
225	SHEEP CREEK BASIN	1922-12	Apr. 29, 1933	27.46	2,450	-	-	3,070	13.6
2220	Kettle River near Ferry, Wash.	1922-12	May 27, 1942	20.54	18,200	-	4 a.m. May 29	21,200	9.55
3,800	Kettle River near Laurier, Wash.	1922-12	May 28, 1942	20.54	27,400	-	11 p.m. May 29	35,000	9.21
70	Curler Creek near Curler, Wash.	1917-21	May 30, June 26, 1917	-	ab. 2065	-	-	139	1.99
107	SHERMAN CREEK BASIN	-	-	-	-	-	-	740	6.92
1,010	COLVILLE RIVER BASIN	1922-12	Apr. 20, 1938	26.10	202,720	-	11:15 a.m. to 1:25 p.m. May 14 7:30 a.m. May 4	202,200	2.18
82	Mill Creek near Colville, Wash.	1940-12	Apr. 19, 1946	5.19	466	-	-	538	6.96
163	HALL CREEK BASIN	1912-29	Apr. 16, 1914	-	20685	-	-	1,770	10.9
596	Hall Creek near Inchellum, Wash.	1944-12	Apr. 26, 1946	9.40	11,700	19.6	6 a.m. May 21	11,300	19.0
126	SFOKAS RIVER BASIN	-	-	-	-	-	-	-	-
125	Coeur d'Alene River near Pritchard, Idaho	-	-	-	-	-	-	-	-

z Furnished by Office of Indian Affairs.  
a Flood of 1894 reached a stage of 22 feet  
b From drainage area of 9½ square miles.  
c Observed.

Table 3.- Summary of flood stages and discharges—Continued

No. on map	Stream and place of determination	Drainage area (sq.mi.)	Period of record	Maximum previously known				Maximum during May-June 1948				
				Date	Gage height (feet)	Discharge (sec.-ft.)	Sec.-ft. per sq. mi.	Date and hour	Gage height (feet)	Discharge (sec.-ft.)	Sec.-ft. per sq. mi.	Method of determination
SPOKANE RIVER BASIN--Continued												
127	Coeur d'Alene River at Kootenai, Idaho	895	1939-47	Apr. 15, 1945	ad 71.80	17,700	19.8	1 p.m. May 21	69.89	14,600	16.3	
128	Coeur d'Alene River near Cataldo, Idaho	1,220	1911-12, 1920-48	Dec. 22 or 23, 1933	56.9	55,300	45.3	10 a.m. to 3 p.m. May 21	47.47	18,600	15.2	
129	Spokane River at Post Falls, Idaho	3,880	1913-48	Dec. 25, 1933	-	50,100	12.9	10 p.m. May 30	478.98	40,300	10.4	
132	Spokane River at Spokane, Wash.	4,350	1891-1948	May 31, 1894	-	49,000	-	1:50 a.m. May 31	28.35	39,600	9.10	
134	Spokane River at Long Lake, Wash.	6,100	1939-48	May 15, 1946	76.15	41,800	-	11 p.m. May 24	78.66	49,400	8.10	
136	St. Joe River above North Fork, near Avery, Idaho	472	-	-	-	-	-	May 29	-	13,400	28.4	Slope area
137	St. Joe River at Calder, Idaho	1,080	1911-12, 1920-48	Dec. 23, 1933	-	53,000	49.1	6 a.m. May 28	89.04	23,700	21.9	
138	North Fork St. Joe River near mouth, at Avery, Idaho	111	-	-	-	-	-	About May 28	-	3,500	31.5	Do.
139	St. Maries River at Lotus, Idaho	as 37	1911-12, 1920-48	Dec. 22, 23, 1933	42.1	23,800	55.2	May 24	6.5	7,500	-	Do.
140	Hayden Creek near Hayden Lake, Idaho	as 22.0	1946-48	Apr. 17, 1948	4.38	680	26.2	May 9	-	3320	434.5	
141	Letah Creek at Spokane, Wash.	630	1948	-	-	-	-	1 a.m. May 24	418.73	11,900	18.9	
143	Little Spokane River near Dartford, Wash.	663	1948	-	-	-	-	6 to 8 p.m. May 24	7.12	2,170	3.27	
SAMPOLL RIVER BASIN												
144	Sampoll River at West Fork, Wash.	260	-	-	-	-	-	-	-	748	2.88	
145	Sampoll River at Keller, Wash.	942	1911-17	Apr. 13, 1916	-	as 1,920	-	-	-	3,290	3.49	
146	West Fork Sampoll River at West Fork, Wash.	319	-	-	-	-	-	-	-	879	2.76	
OKANOGAN RIVER BASIN												
147	Okanogan River at Oroville, Wash.	3,320	1942-48	May 17, 1946	(ab)	2,230	-	11 a.m. to noon June 2	(ab)	3,480	1.05	
148	Okanogan River near Tonasket, Wash.	7,250	1911-25	Apr. 27, 1934	18.3	25,400	-	11 a.m. to noon May 31	21.79	40,900	5.64	
149	Similkameen River near Nighthawk, Wash.	3,420	1928-48	Apr. 26, 1934	14.96	27,200	-	10 a.m. May 30	17.62	38,700	11.3	
150	Sinlaketin Creek near Loomis, Wash.	112	-	-	-	-	-	-	-	2,020	18.0	

151	Toots Ootsee Creek near Loomis, Wash.	132	1920-26	June 3, 1922	-	985	-	-	-	-	6,010	45.5
152	Salmon Creek above Concomully, Wash.	43	-	-	-	-	-	-	-	-	3,020	70.2
153	Salmon Creek below Concomully, Wash.	126	1910-22	July 20-22, 1921	-	ae104	-	-	-	-	782	6.21
154	Salmon Creek at Okanogan, Wash.	170	1903-12	Apr. 29, 1904	-	ae577	-	-	-	-	735	4.32
METHOW RIVER BASIN												
155	Methow River near Ventura, Wash.	58	-	-	-	-	-	-	-	-	4,130	71.2
156	Methow River near Winthrop, Wash.	1,020	1912	May 1912	-	ae9,250	-	-	-	-	35,000	34.3
157	Methow River at Twisp, Wash.	1,330	1912-20	May 26, 1912	10.76	21,300	-	2 p.m. May 26	12.94	-	40,600	30.7
158	Methow River near Pateros, Wash.	1,790	1912-20	May 11, 1910	-	ae2411,900	-	-	-	-	46,700	26.1
159	Chewack Creek above Boulder Creek, near Winthrop, Wash.	390	-	-	-	-	-	-	-	-	19,100	49.0
160	Chewack Creek at Winthrop, Wash.	548	1912-13	June 1913	-	ae2,640	-	-	-	-	18,100	33.0
161	Twisp River at Twisp, Wash.	248	-	-	-	-	-	-	-	-	9,440	38.1
162	Rainy Creek near Methow, Wash.	6.6	-	-	-	-	-	-	-	-	ae20,000	3,030
CHELAN RIVER BASIN												
163	Stehakin River at Stehakin, Wash.	372	1910-15, 1927-48	June 2, 1936	27.18	12,900	-	2 a.m. May 29	29.00	-	18,600	50.0
164	Chelan River at Chelan, Wash.	950	1903-48	June 3, 1936	-	ae12,800	-	May 30	-	-	ae16,000	16.8
165	Railroad Creek at Lucerne, Wash.	64	1910-13, 1927-48	June 8, 1927	5.3	1,910	-	May 28	ae8.1	-	3,900	60.9
166	Prince Creek near Lucerne, Wash.	35	-	-	-	-	-	-	-	-	24,700	706
167	Twenty-five Mile Creek near 25-miles ranger station, Wash.	39	-	-	-	-	-	-	-	-	1,180	30.3
EMETAT RIVER BASIN												
168	Emet River near Brier, Wash.	207	-	-	-	-	-	-	-	-	7,260	35.1
169	Emet River near Emiet, Wash.	417	1910-25	June 17, 1916	-	5,150	-	-	-	-	10,600	25.9
170	Mad River near Ardenvoir, Wash.	87	-	-	-	-	-	-	-	-	1,550	17.8

ae Floods of December 1933 and April 1938 reached stages of 79.47 and 78.16 feet respectively.  
 ae From drainage area of 1,810 square miles.  
 ae Possibly due to release from temporary dam caused by landslide.  
 ae From drainage area of 971 square miles.

h Mean daily discharge.  
 m From floodmark.  
 n Site and datum them in use.  
 u Affected by regulation.  
 ac Observed.

Table 3.-Summary of flood stages and discharges--Continued

No. on map	Stream and place of determination	Drainage area (sq.mi.)	Period of record	Maximum previously known				Maximum during May-June 1948			
				Date	Gage height (feet)	Discharge (sec.-ft.)	Sec.-ft. per sq. mi.	Date and hour	Gage height (feet)	Discharge (sec.-ft.)	Sec.-ft. per sq. mi. Method of determination
PINE CANYON CREEK BASIN											
171	Pine Canyon Creek near Waterville, Wash.	ak10.4	1945-47	Feb. 22, 1947	4.1	265	-	-	-	5,350	514
172	South Fork Pine Canyon Creek near Waterville, Wash.	ak5.4	-	-	-	-	-	-	-	25,000	4,630
WENATCHEE RIVER BASIN											
173	Wenatchee River below Wenatchee Lake, Wash.	277	1932-42, 1946-48	June 16, 1933	1,876.57	8,310	-	6 a.m. May 29	1,879.65	13,700	49.5
174	Wenatchee River at Plain, Wash.	591	1910-29	Dec. 13, 1921	n11.8	20,800	-	8 a.m. May 29	12.43	22,700	38.4
175	Wenatchee River at Peshastin, Wash.	1,000	1929-48	June 16, 1933	11.82	20,400	-	8 p.m. May 28	15.87	33,200	32.2
176	Wenatchee River near Cashmore, Wash.	1,200	1904-17	Dec. 30, 31, 1917	-	27,100	-	-	-	34,600	28.8
177	Little Wenatchee River near Tolme, Wash.	86	-	-	-	-	-	-	-	5,270	61.3
178	Hason Creek near Hason, Wash.	86	1911	June 13, 1911	-	1,390	-	-	-	5,200	60.5
179	Chiwawa River near Plain, Wash.	169	1911-14, 1936-48	May 25, 26, 1938	7.66	3,210	-	3 a.m. May 29	9.17	5,880	34.8
180	Phelps Creek near Plain, Wash.	16.4	1926-51	June 7, 1927	-	361,080	-	-	-	1,530	93.3
181	Idicle Creek above Snow Creek, near Jensen, Wash.	193	1936-48	June 3, 1937	10.10	4,320	-	3 p.m. May 28	13.93	17,500	90.7
182	Peshastin Creek at Hewitt, Wash.	40	1911-12	May 12, 13, 1912	-	221	-	-	-	713	17.8
183	Mission Creek near Cashmore, Wash.	78	-	-	-	-	-	-	-	408	5.23
MOSES CREEK BASIN											
184	Moses Creek near Alstom, Wash.	ak119	-	-	-	-	-	-	-	6,420	53.9
185	Moses Creek at Palisades, Wash.	ak61.5	-	-	-	-	-	-	-	3,680	5.98
GRAB CREEK BASIN											
186	Grab Creek at Irby, Wash.	-	1942-48	Feb. 25, 1946	6.65	965	-	5 a.m. June 12	6.98	1,190	-
187	Grab Creek near Moses Lake, Wash.	-	1942-48	Mar. 2, 1946	3.47	456	-	2:30 p.m. June 16	3.75	618	-

188	Orab Creek near Varden, Wash.	1909-12, 1942-48	Feb. 7, 1943	m4.25	3,000	-	6 p.m. May 28	8.45	28	-
189	Orab Creek near Smyrna, Wash.	1942-48	Feb. 8, 1943	m7.5	3,300	-	3 a.m. May 28	1.97	19.8	-
190	Park Creek below Park Lake, near Coulee City, Wash.	1945-48	Feb. 10, 1948	2.67	25	-	8 to 10 a.m. June 12	2.32	13.6	-
191	Iron Springs Creek at Ephrata, Wash.	-	-	-	-	-	-	-	3,080	-
192	Rocky Ford Creek near Ephrata, Wash.	1909-11, 1942-48	Aug. 29, 1942	2.70	m120	-	5 p.m. June 28	1.96	m71	-
YAKIMA RIVER BASIN										
193	Yakima River near Martin, Wash.	1903-48	Mar. 26, 1915	-	m7,370	-	6 a.m. May 29	8.59	m4,150	75.4
194	Yakima River at Ole Elum, Wash.	1906-48	Nov. 14, 1906	m12.5	25,600	-	7 to 11 a.m. May 29	12.31	16,700	33.4
195	Yakima River at Untanum, Wash.	1906-48	Nov. 15 or 16, 1906	m4.1	41,000	-	6 p.m. May 29	38.98	27,700	17.1
196	Yakima River near Parker, Wash.	1906-21, 1931-48	Dec. 23, 1933	m15.0	54,300	-	10 p.m. May 29	13.42	37,700	10.6
197	Yakima River at Kiona, Wash.	1896-1915, 1933-48	Dec. 23, 1933	21.57	m71,100	-	8 a.m. May 31	17.20	37,900	6.87
198	Kachess River near Easton, Wash.	1903-48	Aug. 27, 1920	-	2,240	-	8 p.m. May 28	7.12	2,530	39.5
199	Ole Elum River near Roalyn, Wash.	1903-48	Nov. 15, 1906	m4.05	m18,700	-	8 to 9 p.m. May 28	14.00	11,000	94.5
200	Teanaway River near Ole Elum, Wash.	1909-14, 1946-48	Mar. 20, 1910	m7.20	4,030	-	10 p.m. May 28	m35.57	4,170	20.3
202	Haches River below Tieton River, near Haches, Wash.	1905, 1908-12, 1915-48	Dec. 22, 23, 1933	-	32,200	-	4 p.m. May 28	17.58	12,600	13.4
203	Bumping River near Hile, Wash.	1905-48	Dec. 29, 1917	9.33	5,180	-	6:45 a.m. June 8	5.35	1,860	27.4
204	American River near Hile, Wash.	1909-11, 1913-15, 1939-48	June 2, 1909	m4.55	m1,580	-	10 p.m. May 27	m76.60	2,600	32.9
205	Rattlesnake Creek near Hile, Wash.	-	-	-	-	-	-	-	1,480	19.9
206	Tieton River at Tieton Dam, near Haches, Wash.	1908-14, 1912-15, 1925-48	Dec. 22, 1933	9.24	8,450	-	10 p.m. June 11	6.53	2,930	15.7
207	Tieton River at headworks of Tieton Canal, near Haches, Wash.	1907-48	Dec. 22, 1933	9.70	8,910	-	3 p.m. June 11	5.67	2,960	12.3
208	North Fork Altamum Creek near Tumplac, Wash.	1907-24, 1931-48	Dec. 22, 1933	-	755	-	5 a.m. May 27	2.37	770	11.2

ac Observed.

ak Approximate.

am Greatest known flood since 1905.

an Estimated by observer.

ap Greatest known flood since 1896.

m From floodmark.

n Site and datum then in use.

u Affected by regulation.

x Small dam above station failed.



Table 3.—Summary of flood stages and discharges.—Continued

No. on map	Stream and place of determination	Drainage area (sq.mi.)	Period of record	Maximum previously known				Maximum during May-June 1948			
				Date	Gage height (feet)	Discharge (sec.-ft.)	Sec.-ft. per sq. mi.	Date and hour	Gage height (feet)	Discharge (sec.-ft.)	Sec.-ft. per sq. mi.
YAKIMA RIVER BASIN—Continued											
209	South Fork Abasco Creek at Conrad Ranch, near Tropic, Wash.	24.5	1915-24, 1931-48	Dec. 23, 1933	3.10	sec 24	-	8 a.m. June 16	2.34	sec 263	10.7
SNAKE RIVER BASIN											
Snake River main stem											
211	Snake River at Moru, Wyo.	816	1903-48	June 12, 1918	110.41	15,100	18.5	1 p.m. July 13	9.44	us 770	10.7
212	Snake River below Greys River, at Alpine, Idaho	3,940	1904-48	June 7, 1946	99.15	22,400	5.69	7 p.m. June 3	99.66	us 4,200	6.14
213	Snake River near Boise, Idaho	5,740	1910-48	May 19, 1927	16.0	60,000	10.5	7 a.m. June 4	9.04	us 30,500	5.3
214	Snake River near Shelley, Idaho	10,300	1889-90, 1892-94, 1915-48	June 6, 1894	-	70,000	6.8	1 p.m. June 5	12.33	us 7,600	2.7
215	Snake River near Blackfoot, Idaho	11,700	1910-48	June 18, 1918	14.80	46,200	3.9	4 a.m. June 6	10.52	us 3,900	2.0
216	Snake River at Mealey, Idaho	14,100	1906-48	June 20, 1918	13.5	48,400	3.4	9 p.m. June 23	9.25	us 6,100	1.8
217	Snake River near Minidoka, Idaho	15,700	1910-48	June 21, 1918	16.0	45,900	2.9	5 p.m. June 24	12.0	us 4,800	1.6
218	Snake River at Milner, Idaho	17,400	1909-48	June 12, 1909	20.1	44,400	2.5	8 p.m. June 24	17.72	us 7,000	1.0
219	Snake River near Kimberly, Idaho	-	1923-48	July 4, 1927	13.76	27,200	-	1 a.m. June 25	17.70	us 6,200	-
220	Snake River near Buhl, Idaho	-	1946-48	June 13, 1947	10.34	23,100	-	5 a.m. June 25	8.49	us 7,800	-
221	Snake River below Lower Salmon Falls, near Ragerman, Idaho	-	1937-48	June 7, 1943	15.66	28,800	-	10:30 a.m. June 25	13.46	us 2,500	-
222	Snake River at King Hill, Idaho	-	1909-48	June 22, 1918	16.3	47,200	-	3 p.m. June 25	11.07	us 3,400	-
223	Snake River near Murphy, Idaho	-	1912, 1913-48	June 22, 1918	-	47,300	-	8 a.m. June 6	9.00	us 4,100	-
224	Snake River at Vesper, Idaho	-	1910-48	Mar. 3, 1910	-	sec 100,000	-	2 p.m. June 4	10.51	us 4,300	-
225	Snake River at Orlov, Oreg.	-	1923-48	Apr. 21, 1943	20.71	74,600	-	4:30 a.m. June 5	17.55	us 5,100	-
226	Snake River near Clarkston, Wash.	103,200	1909-48	May 20, 1921	-	270,000	-	6 p.m. May 29	40.36	us 68,200	3.57
Tributaries above Salt River											
227	Pacific Creek near Moran, Wyo.	160	1917-48, 1944-48	June 15, 1918	23.98	3,030	18.9	2 a.m. June 3, 2 a.m. June 5	3.61	2,200	13.8

226	Buffalo Fork near Moran, Wyo.	378	1917-18, June 13, 1918 1944-48	Mar 26, 78	5,840	15.4	11 a.m. June 3	5.50	3,900	10.3
229	Gros Ventre River at Kelly, Wyo.	622	1918, June 16, 1918 1944-48	Apr 9, 95	as 6,220	10.0	8 a.m. May 30	p 6.52	3,200	5.14
230	Hoback River near Jackson, Wyo. Salt River Basin	564	1917-18, June 16, 1918 1944-48	Mar 23, 46	6,160	10.9	6:30 a.m. May 29	p 5.53	3,180	5.64
231	Crow Creek near Fairview, Wyo.	114	1946-48, Apr. 19, 1946	p 3.00	236	2.07	5:30 a.m. May 18 6 a.m. May 20	2.68	184	1.61
232	Stump Creek near Auburn, Wyo. Henry Fork Basin	103	1946-48, Apr. 26, 1946	p 3.74	469	4.55	2 a.m. May 18 2 a.m. May 20	3.61	490	4.76
233	Henry Fork near Lake, Idaho	104	1920-48, June 13, 1926	5.40	907	8.7	1 p.m. July 15	3.00	4364	3.5
234	Henry Fork near Island Park, Idaho	478	1933-48, June 1, 1943	5.96	2,580	5.4	2 p.m. July 17	5.22	41,930	4.0
235	Henry Fork at Warm River, Idaho	660	1910-15, May 18, 1927 1916-48	7.55	3,540	5.4	4 a.m. July 18	6.67	42,380	3.6
236	Henry Fork near Ashton, Idaho	1,030	1928-3, May 7, 1925 1920-48	-	6,220	6.0	7 a.m. May 22	7.22	3,300	3.2
237	Henry Fork at St. Anthony, Idaho	1,730	1913-48, May 8, 1925	6.70	9,030	5.2	10 a.m. May 22	5.95	6,490	3.8
238	Henry Fork near Burburg, Idaho	3,010	1908-48, June 29, 1927	9.90	9,490	3.1	7 a.m. May 23	9.22	6,740	2.2
239	Fall River near Squirrel, Idaho	380	1904-8, June 27, 1927 1917-48	-	6,440	16.9	June 8	3.64	3,690	9.7
240	Fall River near Chester, Idaho	560	1920-48, June 27, 1927	6.60	6,380	11.4	4 a.m. May 21	5.23	4,090	7.3
241	Teton River near Victor, Idaho	47.6	1946-48, June 6, 1946	1.58	310	6.51	12:30 to 2 a.m. June 8	1.86	398	8.36
242	Teton River near Teton, Idaho	460	1923-48, June 28, 1945	2.97	1,900	4.1	2 a.m. May 30	2.42	1,330	2.9
243	Teton River near St. Anthony, Idaho	920	1903-3, June 5, 1909 1920-48	46.90	7,820	8.5	6 p.m. May 29	6.22	3,560	3.9
244	Teton Creek near Driggs, Idaho	33.8	1946-48, June 19, 20, 1947	3.47	788	23.3	11 p.m. June 8	3.91	925	27.4
245	Horseshoe Creek near Driggs, Idaho	11.7	1946-48, June 9, 1947	3.19	60	5.13	8:30 p.m. May 17	3.32	61	5.21
246	Pack saddle Creek near Teton, Idaho Blackfoot River Basin	5.7	1946-48, May 3, 4, 1947	1.51	27	4.74	6 p.m. June 2	1.79	38	6.67
247	Blackfoot River near Blackfoot, Idaho	1,100	1913-48, May 21, 1921	-	868	.8	8 a.m. May 19	5.75	598	.5
248	Portneuf River at Pocat, Idaho Portneuf River Basin	-	1913-15, Apr. 3, 1913 1910-48	np 6.1	902	-	5 p.m. May 20	p 2.82	466	-

at 1917-18 at site  $\frac{1}{2}$  mile above mouth, published as Hoback River near Chaney.

aq Greater flood occurred in 1894, as Datum then in use.  
u Affected by regulation.  
as Considerably greater flood occurred May 18, 1927, due to release of 60,000 acre-feet from temporary dam caused by landslide.

n Site and datum then in use.  
p Staff-gage reading.  
u Affected by regulation.  
as Observed.  
ak Approximate.

Table 3.—Summary of flood stages and discharges—Continued

No. on map	Stream and place of determination	Drainage area (sq.mi.)	Period of record	Maximums previously known				Maximum during May-June 1948			
				Date	Gage height (feet)	Discharge (sec.-ft.)	Sec.-ft. per sq. mi.	Date and hour	Gage height (feet)	Discharge (sec.-ft.)	Sec.-ft. per sq. mi.
<u>SHAKE RIVER BASIN--Continued</u>											
<u>Fortneuf River Basin--Continued</u>											
249	Fortneuf River at Pocatello, Idaho	-	1897-99, 1911-14, 1937-48	(au)	-	(av)	-	6 to 8 p.m. May 20	6.07	733	-
250	Birch Creek near Downey, Idaho	-	1911-14, 1937-48	July 15, 1938	-	95	-	May 17-20	pl.30	25	-
<u>Tributaries between Fortneuf River and Salmon Falls Creek</u>											
251	Raft River at Peterson Ranch, near Bridge, Idaho	-	sw1909-15, 1946-48	June 12, 1912	p6.5	as457	-	9 a.m. to 12 p.m. May 11	1.69	35	-
252	Goose Creek above Trapper Creek, near Oakley, Idaho	-	1911-16, 1919-48	Jan. 23 or Feb. 24, 1943	m7.6	1,670	-	8 p.m. May 20	3.09	164	-
253	Trapper Creek near Oakley, Idaho	-	1911-16, 1919-48	Aug. 17, 1941	6.99	as270	-	3 a.m. May 19	5.15	33	-
254	Rock Creek near Rock Creek, Idaho	-	1909-13, 1938-39, 1943-48	May 21, 1912	as10.4	429	-	1 a.m. May 19	2.82	227	-
<u>Salmon Falls Creek Basin</u>											
255	Salmon Falls Creek near San Jovinto, Nev.	-	1909-16, 1918-48	Feb. 24, 1943	(as)	(ba)	-	4 a.m. May 21	5.92	549	-
256	Big Lost River at Howell Ranch, near Chilly, Idaho	448	1904-14, 1920-48	June 12, 1921	5.94	3,500	7.81	7 a.m. June 9	4.35	2,390	5.33
257	Big Wood River at Hailley, Idaho	640	1889, 1915-48	June 7, 1938	b67.31	4,480	7.00	2 p.m. June 3	6.14	2,920	4.56
258	Big Wood River near Bellevue, Idaho	823	1911-48	June 16, 1921	6.07	3,660	4.45	10 p.m. June 3	4.36	1,720	2.09
259	Big Wood River below Magic Dam, near Richfield, Idaho	-	1911-48	Apr. 13, 1943	13.31	7,160	-	11 p.m. June 12	4.56	as,050	-
260	Big Wood River at Gooding, Idaho	-	1921-48	Apr. 13, 1943	10.21	as,120	-	10 a.m. May 1	2.06	as44	-
261	Big Wood River near Gooding, Idaho	-	1916-48	Apr. 14, 1943	9.80	as,220	-	1 p.m. June 23	2.65	as210	-
262	Warm Springs Creek at Oyster Hot Springs, near Ketchum, Idaho	96	1940-48	May 30, 1943	3.36	696	7.25	1 a.m. May 29	2.79	468	4.88
263	Big Wood Slough at Hailley, Idaho	-	1915-48	June 6, 1921	b63.0	419	-	8 a.m. May 25	2.60	as33	-
264	Canas Creek near Elaine, Idaho	618	1912-48	Apr. 8, 1943	15.45	9,780	15.8	noon May 1	3.17	as288	4.47

		1920-26, 1941-42, 1944-48	Apr. 10, 1942	4.31	1,420	5.32	2:30 a.m. May 29	2.82	595	2.23
265	Little Wood River at Campbell Ranch, near Carey, Idaho	1941-42, 1944-48	Apr. 20, 1938	12.07	646,000	19.2	2 p.m. May 29	4.64	612	1.96
266	Little Wood River near Carey, Idaho	1941-42, 1944-48	May 3, 1938	3.97	4868	-	6 a.m. to noon May 10	1.67	433	-
267	Little Wood River near Richfield, Idaho	1911-48	Apr. 3, 1923	403.29	312	-	5 p.m. June 22	2.01	153	-
269	Silver Creek near Pico, Idaho	1920-48								
	<u>Bruneau River Basin</u>									
270	Bruneau River near Winter Camp Ranch, Idaho	1946-48	May 9, 1947	3.07	1,290	-	6 p.m. June 6	3.47	1,600	-
271	Bruneau River near Hot Spring, Idaho	1909-15, 1943-48	Mar. 1, 1910	110.6	45,660	-	8 p.m. June 6	7.02	1,610	-
272	Bruneau River near Cranberry, Idaho	1869-1904, 1908-16, 1944-48	Mar. 2, 1910	110.1	45,700	-	7:30 a.m. June 7	4.41	1,490	-
	<u>Owyhee River Basin</u>									
273	Owyhee River above Owyhee Reservoir, Oreg.	1923-48	Mar. 20, 1932	12.95	16,000	15.4	5 a.m. June 7	6.57	1,790	.17
274	Owyhee River below Owyhee Dam, Oreg.	1923-48	Apr. 15, 1936	12.79	14,600	1.31	2:30 p.m. May 24	1.22	434	.013
275	Jordan Creek above Lone Tree Creek, near Jordan Valley, Oreg.	1945-48	Apr. 19, 1946	5.44	2,100	-	7 a.m. May 18	3.42	905	-
	<u>Boise River Basin</u>									
276	Middle Fork Boise River near Twin Springs, Idaho	1946-48	May 9, 1947	6.88	3,830	10.0	2 a.m. May 29	7.40	4,370	11.4
277	Boise River near Twin Springs, Idaho	1911-48	May 17, 1927	8.30	10,300	12.4	May 28, 29	7.41	8,210	9.89
278	Boise River of Dowling Ranch, near Arrowrock, Idaho	1911-48	Apr. 20, 1943	9.93	48,800	8.47	7 to 10 a.m. May 29	8.28	42,000	5.41
279	Boise River at Boise, Idaho	1940-46	Apr. 20, 1943	10.0	42,000	-	2 p.m. May 29	7.99	49,860	-
280	Boise River at Motus, Idaho	1920-48	Apr. 20, 1943	10.43	42,500	-	8 a.m. June 4	8.23	47,880	-
281	South Fork Boise River near Featherville, Idaho	1945-48	May 9, 1947	6.75	4,300	6.77	3 a.m. May 29	6.87	4,790	7.48
282	South Fork Boise River at Anderson Ranch Dam, Idaho	1945-48	Apr. 17, 1943	10.06	9,100	9.27	3 p.m. June 4	47.05	4,220	4.30
283	Lime Creek near Bennett, Idaho	1945-48	Apr. 19, 1946	6.11	1,180	9.01	8 a.m. May 19	3.95	306	2.34
284	Fall Creek near Anderson Ranch Dam, Idaho	1945-48	Apr. 17, 1946	5.84	793	14.3	5 a.m. May 19	4.73	353	6.38

a From floodmark.  
 n Site and datum then in use.  
 p Staff-gage reading.  
 u Affected by regulation.  
 w Reversed.  
 an Sometime during period May 13 to June 14, 1917.  
 av More than 2,000 second-feet.  
 ba Between 2,060 and 2,420 second-feet.  
 as Exceeded range of recorder, 10.20 feet, but was not more than 1.2 feet higher.  
 ay From rating curve extended above 100 second-feet on basis of weir formula.  
 ax Greater discharge probably occurred Mar. 1, 1910.  
 aw 1909-15 at site about 7 miles downstream.  
 bb Maximum gage height observed 8.66 feet June 12, 1921 (discharge, 3,560 second-feet).  
 bc Higher stages have resulted from ice jams.  
 bd Due to failure of dam on Little Fish Creek.  
 be Maximum gage height, 3.97 feet Jan. 8, 1942 (ice jam).  
 bf From rating curve extended above 1,200 second-feet.

Table 3.—Summary of flood stages and discharges.—Continued

No. on map	Stream and place of determination	Drainage area (sq.mi.)	Period of record	Maximum previously known				Maximum during May-June 1948			
				Date	Gage height (feet)	Discharge (sec.-ft.)	Sec.-ft. per sq. mi.	Date and hour	Gage height (feet)	Discharge (sec.-ft.)	Sec.-ft. per sq. mi.
<u>SHALK RIVER BASIN—Continued</u>											
285	Boise River Basin—Continued Moore Creek near Arrowrock, Idaho	426	1915-48	Apr. 8, 1943	27.1	6,610	15.5	6:50 a.m. May 19	3.80	1,400	3.29
286	Malheur River Basin Malheur River near Drewsey, Oreg.	982	1920, 1921, 1923, 1926-48	Feb. 27, 1940	11.35	4,290	4.37	3 a.m. May 23	5.14	562	.57
287	Malheur River below Warm Springs Reservoir, near Riverside, Oreg.	1,100	1906-17, 1908-17, 1915-48	Mar. 2, 1910	210.7	5,490	4.95	May 28 to June 1	5.03	6550	.50
288	Malheur River near Hope, Oreg.	3,030	1919-48	Feb. 5, 1925	8.1	8,100	2.67	7:30 p.m. June 15	2.04	375	.12
289	North Fork Malheur River above Agency Valley Reservoir, near Seulah, Oreg.	355	1914, 1916-48	Mar. 26, 1940	4.60	975	2.75	7 to 8 a.m. May 28	3.46	701	1.97
290	North Fork Malheur River at Seulah, Oreg.	420	1909-12, 1913-14, 1926-48	May 7, 1942	28.4	27,000	16.7	June 1-16	2.58	2469	1.12
291	Bully Creek near Vale, Oreg.	602	1903-7, 1910-17, 1919, 1922-23, 1933-48	Mar. 1, 1910	28.6	6,240	10.4	10:20 p.m. June 15	1.59	109	.18
<u>Payette River Basin</u>											
292	South Fork Payette River at Lomman, Idaho	456	1941-48	May 29, 1943	6.53	4,860	10.7	10 p.m. May 28	6.73	5,290	11.5
293	South Fork Payette River near Garden Valley, Idaho	779	1921-48	May 26, 1928	8.0	10,600	13.6	6 a.m. June 9	6.43	27,740	9.94
294	South Fork Payette River near Banks, Idaho	1,200	1921-48	May 17, 1927	210.6	13,800	11.5	4 a.m. May 29	9.05	29,690	8.08
295	Payette River near Horsehoe Bend, Idaho	2,230	1906-16, 1915-48	June 9, 1921	9.57	22,100	9.31	10 a.m. June 9	7.93	25,300	6.66
296	Payette River near Sunset, Idaho	-	1925-48	May 1, 1938	12.90	22,800	-	8 p.m. June 3	10.75	26,700	-
297	Payette River near Payette, Idaho	-	1895-97, 1935-48	June 4, 1896	29.30	28,300	-	5:30 a.m. June 4	10.62	15,900	-
298	Clear Creek at Lomman, Idaho	59.6	1941-48	May 31, 1943	2045.32	754	12.7	7:30 p.m. May 28	2.96	692	11.6
299	Deadwood River below Deadwood Reservoir, near Lomman, Idaho	108	1926-48	May 26, 1928	25.67	2,150	19.9	4 a.m. to noon June 10	4.72	21,380	12.8
300	Deadwood River near Lomman, Idaho	230	1921-48	May 9, 1928	5.17	4,230	18.4	5 p.m. June 9	3.32	22,090	9.09

		144	1908-17, 1919-46 1941-46	June 10, 1933	7-5	4,260	29.6	9 a.m. June 4	7-21	u3,710	85.8
301 North Fork Payette River at McCall, Idaho		626	1941-46	May 10, 1947	6.29	7,320	11.7	9 a.m. June 15	4.89	u5,290	8.45
302 North Fork Payette River at Cascade, Idaho		933	1941-46	June 3, 1943	10.70	9,110	9.76	1 p.m. June 3	11.62	u5,840	6.26
303 North Fork Payette River near Banks, Idaho		48.9	1947-48 1945-46	May 7, 1947	8.19	1,570	32.1	10 a.m. June 3	9.19	bu2,600	53.2
304 Lake Fork Payette River above Jumbo Creek, near McCall, Idaho		-	1940-46	May 9, 1947	6.39	u1,520	-	6 p.m. June 3	7.09	u2,120	-
305 Lake Fork Payette River below Lake Irrigation District Canal, near McCall, Idaho											
Weiser River Basin											
306 Weiser River at Tamarack, Idaho		36.5	1936-46	Mar. 27, 1940	6.00	775	21.2	4 p.m. May 7	4.58	u58	12.5
307 Weiser River at Starkey, Idaho		106	1920, 1933-46	Mar. 27, 1940	6.00	bu2,490	23.1	11 a.m. May 7	4.61	957	9.03
308 Weiser River near Council, Idaho		390	1937-46	Mar. 16 or 17, 1936	ma7.6	bu6,700	17.2	6 to 9 p.m. May 22	6.41	2,530	6.49
309 Weiser River near Cambridge, Idaho		605	1939-46	Mar. 31, 1940	8.30	6,670	11.0	5:30 p.m. June 3	7.21	4,320	7.14
310 Weiser River above Crane Creek, near Weiser, Idaho		1,160	1920-46	Mar. 19, 1932	u10.8	bu16,900	14.6	12 p.m. June 3	6.27	6,340	5.47
311 West Fork Weiser River near Fruitvale, Idaho		78	1910-13, 1919-25, 1937-46	Mar. 31, 1940	u3.79	1,170	15.0	May 19, 22, 23	4.49	858	11.0
312 Lost Creek near Tamarack, Idaho		29.4	1910-14, 1920-21, 1924-46	May 17, 1921	4.29	u688	23.4	8:30 a.m. May 23	3.35	u457	15.5
313 Middle Fork Weiser River near Mesa, Idaho		86.5	1919-21, 1937-46	May 1, 1938	-	1,380	16.0	6 p.m. May 27	bu3.80	994	11.5
314 Johnson Creek below Johnson Park, near Council, Idaho		5	1941-46	May 30, 1945	3.00	u201	40.2	4:30 a.m. June 3	3.35	222	44.4
315 Little Weiser River near Indian Valley, Idaho		81.9	1920-21, 1923-27, 1938-46	Feb. 4, 1925	u4.19	u1,840	22.5	7:30 p.m. May 27	4.50	844	10.3
316 Crane Creek near Midvale, Idaho		242	1910-16, 1924-46	Dec. 3, 1910	8.9	4,240	17.5	12:01 a.m. to 4:30 p.m. May 1	1.80	u149	.62
317 Crane Creek at mouth near Weiser, Idaho		288	1920-46	Feb. 7, 1925	6.80	u2,350	8.16	3 p.m. June 3	3.91	u300	1.04
318 Mann Creek near Weiser, Idaho		56	1911-13, 1920	Mar. 27, 1940	u4.5-45	bu1,540	27.5	May 19, 20	-	bu196	3.54
319 Monroe Creek above Sheep Creek, near Weiser, Idaho		-	1937-46 1945-46	Mar. 18, 19, 1946	2.40	bu170	-	8 a.m. May 4	1.22	bu23	-
m From floodmark. n Site and datum then in use. o Affected by backwater. p Higher stages have resulted from ice jams. q 1941-47 at site near Smith Ferry, 12 miles upstream; drainage area, 893 square miles. u Revised.											
bu Maximum gage height, 4.10 feet June 3. bn From rating curve extended above slope- area measurement at gage height 4.21 feet. bp From reading of auxiliary gage.											

Table 3.—Summary of flood stages and discharges—Continued

No. on map	Stream and place of determination	Drainage area (sq.mi.)	Period of record	Maximum previously known				Maximum during May-June 1948			
				Date	Gage height (feet)	Discharge (sec.-ft.)	Sec.-ft. per sq. mi.	Date and hour	Gage height (feet)	Discharge (sec.-ft.)	Sec.-ft. per sq. mi.
SHAKE RIVER BASIN--Continued											
Burnt River Basin											
320	Burnt River near Harsford, Oreg.	309	1915-16, 1928-48	Apr. 17, 1943	4.06	22,220	7.18	May 21, 22	4.12	2476	1.54
Powder River Basin											
321	Powder River at Salisbury, Oreg.	230	1903-14, 1928-48	Mar. 20, 1910	27.05	1,820	7.91	3 p.m. May 28	6.26	1,200	5.22
322	Powder River at Haines, Oreg.	572	1946-48	May 11, 1947	3.75	410	.72	10 p.m. June 8, to 1 a.m. June 9	6.67	1,300	2.27
323	Powder River near Robinette, Oreg.	1,710	1928-48	June 15, 16, 1933	26.9	4,180	2.44	May 28	26.6	5,320	3.11
324	Wolf Creek near North Powder, Oreg.	32.9	1913-14, 1946-48	Apr. 14, 1914	22.70	260	7.90	2 a.m. May 23	4.46	433	13.2
325	Aggie Creek above Skull Creek, near Newbridge, Oreg.	160	-	-	-	-	-	-	-	3,150	19.7
Imnaha River Basin											
326	Imnaha River above Oumboot Creek, Oreg.	98	1944-48	May 8, 1946	3.97	1,940	15.7	11 p.m. May 27	5.07	2,400	24.5
327	Imnaha River at Imnaha, Oreg.	705	1928-48	May 23, 1942	6.70	5,400	7.66	4 a.m. May 28	7.06	5,700	8.09
Salmon River Basin											
328	Salmon River near Obsidian, Idaho	94.7	1940-48	May 30, 1943	-	664	7.01	9 a.m. June 3	4.22	706	7.46
329	Salmon River below Valley Creek, at Stanley, Idaho	525	1928-48	June 27, 1927	4.41	5,020	9.38	1 to 4 p.m. June 9	3.91	4,090	7.64
330	Salmon River below Yankee Fork, near Clayton, Idaho	841	1921-48	June 27, 1927	-	268,000	9.51	10 p.m. June 3	9.27	7,060	8.39
331	Salmon River near Challie, Idaho	1,800	1928-48	May 30, 1943	8.07	10,500	5.83	3:30 p.m. June 3	8.04	10,300	5.72
332	Salmon River at Salmon, Idaho	3,760	1912-16, 1919-48	June 12, 1921	9.35	16,400	4.36	11 a.m. June 4	7.32	10,900	2.90
333	Salmon River near Shoup, Idaho	6,270	1944-48	May 10, 1947	7.79	16,600	2.65	5 p.m. June 4	7.90	16,900	2.70
334	Salmon River above South Fork, near Dixie, Idaho	10,420	-	-	-	-	-	May 29	-	55,000	5.28
335	Salmon River near French Creek, Idaho	12,270	1944-48	May 9, 1947	30.7	67,300	5.48	7:25 a.m. May 29	33.50	75,300	6.14
336	Salmon River at Whitebird, Idaho	13,550	1910-17, 1919-48	June 9, 1921	31.2	88,800	6.55	9 to 12 p.m. June 3	32.95	103,000	7.60
337	Alturas Lake Creek near Obsidian, Idaho	35.7	1940-48	May 31, 1943	5.30	612	17.1	Moan to 4 p.m. June 9	5.41	609	17.1
Slope area											
Slope area											

338	Valley Creek at Stanley, Idaho	176	1910-13, 1921-48	May 29, 1921	4.4	1,850	10.5	12:40 p.m. June 3	3.50	1,290	7.33
339	Tamken Fork Salmon River near Clayton, Idaho	195	1921-48	June 12, 1921	26.79	3,360	17.2	2 to 3 a.m. May 29	5.97	2,260	11.6
340	Challie Creek near Challie, Idaho	85	1943-48	May 9, 1947	2.07	388	4.56	2 to 6 a.m. June 4	2.30	418	4.92
341	Panther Creek near Shoup, Idaho	529	1944-48	May 9, 1947	4.20	2,500	4.73	9 a.m. May 29	4.10	2,400	4.54
342	Middle Fork Salmon River near Cape Horn, Idaho	138	1922-48	June 9, 1933, about May 31, 1945	-	2,430	17.6	3 to 4 a.m. June 3	6.26	2,340	17.0
343	Bear Valley Creek near Cape Horn, Idaho	180	1921-48	June 9, 1933	5.19	3,450	19.2	7 a.m. May 29	5.15	2,960	16.4
344	Big Creek near Big Creek, Idaho	470	1944-48	May 9, 1947	5.8	4,010	8.53	June 3	7.12	5,800	12.3
345	South Fork Salmon River near Knox, Idaho	92	1922-48	June 9, 1933	24.69	1,560	17.0	10:40 p.m. May 27	5.99	1,330	14.5
346	South Fork Salmon River at Krasel ranger station, Idaho	324	-	-	-	-	-	Probably May 28	-	5,200	16.0
347	South Fork Salmon River near Warren, Idaho	1,160	1931-43	June 9, 1933	13.16	br20,000	17.2	Probably May 28	13.7	br23,000	19.8
348	East Fork South Fork Salmon River at mouth, near Yellow Pine, Idaho	424	-	-	-	-	-	Probably May 28	-	10,400	24.5
349	Johnson Creek near landmark ranger station, Idaho	54.7	1942-48	May 8, 9, 1947	5.62	1,240	22.7	11 p.m. May 27	5.95	1,510	27.6
350	Johnson Creek at Yellow Pine, Idaho	213	1922-48	June 9, 1933	7.62	5,150	24.2	11:30 p.m. May 27	7.01	4,620	21.7
351	Seeseh River near Burgdorf, Idaho	102	1943-48	May 7, 1947	7.12	1,580	15.5	7:40 a.m. June 3	8.24	2,500	24.5
352	Warren Creek near Warren, Idaho	37	1943-48	May 27, 1943	br5.37	790	21.4	June 3	m5.3	1,100	29.7
353	Warren Creek below Schissler Creek, near Warren, Idaho	65	-	-	-	-	-	Probably June 3	-	1,700	26.2
354	Little Salmon River above Round Valley Creek, near New Meadows, Idaho	189	-	-	-	-	-	About June 1	-	3,300	17.5
355	Little Salmon River 2 miles above mouth, near Riggin, Idaho	550	-	-	-	-	-	Probably June 1	-	9,200	16.7
356	Mud Creek near Tamarack, Idaho	15.8	1937-38, 1945-48	Probably May 1, 1938	m3.34	ak300	19.0	Room May 7	4.12	204	12.9
357	Rapid River below Shingle Creek, near Pollock, Idaho	122	-	-	-	-	-	Probably May 29	-	1,600	13.1
358	Slate Creek near Slate Creek, Idaho	127	-	-	-	-	-	About June 1	-	2,600	20.5
359	Whitebird Creek at Whitebird, Idaho	96	-	-	-	-	-	May 22	-	3,500	36.5
	Grande Ronde River Basin										
360	Grande Ronde River near Milgard, Oreg.	489	1937-48	Dec. 12, 1946	5.22	3,240	6.65	3:30 a.m. May 28	5.26	3,300	6.75

m From floodmark.  
n Site and datum then in use.  
o Affected by regulation.  
p Approximate.

br From rating curve extended above 11,000 second-feet by logarithmic plotting.  
bq Estimated.  
bs Site then in use.

bq Estimated.

br From rating curve extended above 11,000 second-feet by logarithmic plotting.

bs Site then in use.

m From floodmark.

n Site and datum then in use.

u Affected by regulation.

ak Approximate.



Table 3.-Summary of flood stages and discharges—Continued

No. on map	Stream and place of determination	Drainage area (sq. mi.)	Period of record	Maximum previously known				Maximum during May-June 1948				
				Date	Gage height (feet)	Discharge (sec.-ft.)	Sec.-ft. per sq. mi.	Date and hour	Gage height (feet)	Discharge (sec.-ft.)	Sec.-ft. per sq. mi.	Method of determination
SNAKE RIVER BASIN—Continued												
361	Grande Ronde River Basin—Continued Grande Ronde River at Lew Grande, Oreg.	678	1903-15, 1918-23, 1925-48	Mar. 18, 1932	8.90	8,680	13.1	9 p.m. May 22	7.04	4,620	6.81	
362	Grande Ronde River at Rondova, Oreg.	2,555	1925-48	Mar. 18, 1932	9.30	18,300	7.16	2 a.m. May 28	9.76	19,900	7.79	
363	Grande Ronde River at Troy, Oreg.	3,275	1904-48	Dec. 15, 1946	23.20	26,500	8.09	May 27	22.15	23,600	7.21	
364	Catherine Creek near Union, Oreg.	105	1906-7, 1911-12, 1915, 1918-19, 1925-48	May 21, 1912 June 3 or 4, 1933	-	1,240	11.8	8 to 9 p.m. May 27	4.57	1,740	16.6	
365	Little Creek near Union, Oreg.	29.6	-	-	-	-	-	-	-	330	11.1	Slope area
366	Indian Creek near Imbler, Oreg.	22	1938-48	May 28, 1946	3.14	730	33.2	9.11 p.m. May 27	3.52	818	37.2	
367	East Fork Wallawa River near Joseph, Oreg.	9.6	1924-48	July 25, 1937	23.63	300	31.2	4 p.m. June 8	2.70	171	17.8	
368	Hurricane Creek near Joseph, Oreg.	31	1915, 1924-48	July 7, 1943	3.13	774	25.0	11:30 p.m. June 9	3.55	1,110	35.5	
369	Lostine River near Lostine, Oreg.	70	1912-14, 1915, 1925-48	May 27, 1913	-	2,540	36.3	11:30 p.m. June 9	7.27	1,960	28.0	
370	Dear Creek near Wallawa, Oreg. Asotin Creek Basin	68	1915, 1924-48	Apr. 22, 1936	23.82	1,620	23.8	4 a.m. June 11	3.29	1,180	17.4	
371	Asotin Creek near Asotin, Wash. Clearwater River Basin	171	1904-6, 1910-11	Apr. 15, 1904	24.3	261,180	-	8 a.m. May 28	2.80	26511	2.99	
372	Selway River below Deep Creek, at McGrader ranger station, Idaho	211	-	-	-	-	-	About May 28	-	3,700	17.5	Slope area
373	Selway River above Meadow Creek, near Lovell, Idaho	1,550	1944-48	May 8, 1947	218.85	33,200	21.4	May 29	222.4	3442,000	27.1	
374	Selway River near Lovell, Idaho	1,310	1929-48	May 8, 1947	13.71	37,000	19.4	4 a.m. May 29	16.04	48,900	25.6	
375	Clearwater River at Kamiah, Idaho	4,850	1910-48	June 10, 1933	2216.53	81,400	16.8	8 a.m. May 29	19.22	99,000	20.4	
376	Clearwater River at Spalding, Idaho	9,570	1926-48	Dec. 23, 1933	-	172,000	19.0	3 p.m. May 29	23.76	177,000	18.5	
377	White Sand Creek at mouth, near Powell ranger station, Idaho	244	-	-	-	-	-	May 29	-	8,100	33.2	Slope area

	1,180	1929-ls	June 10, 1933	13.44	34,800	29.5	5:30 a.m. May 29	13.62	34,600	29.3	
378 Lochan River near Lovell, Idaho	172	-	-	-	-	-	May 29	-	5,700	33.1	Slope area
379 Crooked Fork at mouth, near Powell ranger station, Idaho	261	1944-ls	May 9, 1947	11.86	2,200	8.43	7:35 a.m. May 29	13.06	3,700	14.2	
380 South Fork Clearwater River near Elk City, Idaho	434	-	-	-	-	-	May 29	-	6,600	15.2	Slope area
381 South Fork Clearwater River below Fall Creek, near Golden, Idaho	865	1910-16, 1923-ls	May 30, 1912	9.7	9,830	11.4	8 a.m. May 29	12.50	12,600	14.6	
382 South Fork Clearwater River near Orangeville, Idaho	199	-	-	-	-	-	May 29	-	3,600	18.1	Dam
383 Orofino Creek near Orofino, Idaho	201	-	-	-	-	-	May 28 or 29	-	9,900	49.3	Slope area
384 North Fork Clearwater River above Kelly Creek, near Bungalow ranger station, Idaho	996	1944-ls	May 8, 1947	9.17	19,700	19.8	1:30 a.m. May 29	11.13	27,400	27.5	
385 North Fork Clearwater River at Bungatow near Little North Fork, Idaho	1,460	-	-	-	-	-	May 29	-	37,000	25.3	Slope area
386 North Fork Clearwater River above Little North Fork near Headquarters, Idaho	2,440	1926-ls	Dec. 23, 1933	235.5	100,000	41.0	Even May 29	25.79	55,600	22.8	
387 North Fork Clearwater River near Abusika, Idaho	380	-	-	-	-	-	May 28 or 29	-	13,000	34.2	Slope area
388 Kelly Creek at mouth, near Bungalow ranger station, Idaho	414	-	-	-	-	-	Probably May 29	-	14,000	33.8	Do.
389 Little North Fork Clearwater River at mouth, near Headquarters, Idaho	460	1944-ls	Feb. 26, 1948	212.6	13,000	28.3	2:10 p.m. May 22	10.53	7,820	17.0	Slope area (Feb. 26, 1948)
390 Potlatch Creek at Kendrick, Idaho	-	-	-	-	-	-	May 22	-	3,800	-	Slope area
391 Lapeau Creek at Lapeau, Idaho	-	1940-ls	Apr. 1, 1943	3.65	176	-	May 22, 1948	4.85	64400	-	
392 Mission Creek near Winchester, Idaho	63	1906-17, 1931-ls	Dec. 12, 1946	4.20	2,430	38.6	4 p.m. May 22	3.20	1,180	18.7	
394 South Fork Walla Walla River near Milton, Ore.	47	1928-ls	Dec. 12, 1946	6.97	1,980	42.1	5 p.m. May 22	5.92	570	12.1	
395 North Fork Walla Walla River near Milton, Ore.	54	1913-17, 1938-ls	Dec. 28, 1945	17.85	1,880	-	5 a.m. May 9	16.34	873	16.2	
396 Mill Creek near Walla Walla, Wash.	90	1935-ls	Dec. 28, 1945	4.0	2,760	-	7 a.m. May 9	2.72	978	10.9	
397 Mill Creek at Walla Walla, Wash.	17	1944-ls	Dec. 28, 1945	1,743.35	72.5	-	4 p.m. May 22	1,742.65	415	24.4	
398 Blue Creek near Walla Walla, Wash.	-	1941-ls	June 7, 1941	4.00	-	-	2 a.m. May 9	2.31	250	-	
399 Yellowbank Creek at Walla Walla, Wash.	-	1941-ls	Feb. 26, 1948	3.25	58	-	2 a.m. May 9	3.28	60	-	
400 Garrison Creek at Walla Walla, Wash.	102	1941-ls	Feb. 26, 1948	5.05	1,380	-	1 a.m. May 13	4.06	820	8.04	

be Site then in use.

bt From rating curve extended above 22,800 second-feet on basis of slope-area measurement.

bu From rating curve extended above 90 second-feet by logarithmic plotting.

m From floodmark.

n Site and datum then in use.

w Revised.

ac Observed.

Table 3.-Summary of flood stages and discharges--Continued

No. on map	Stream and place of determination	Drainage area (sq. mi.)	Period of record	Maximum previously known				Maximum during May-June 1948			
				Date	Gage height (feet)	Discharge (sec.-ft.)	Sec.-ft. per sq. mi.	Date and hour	Gage height (feet)	Discharge (sec.-ft.)	Sec.-ft. per sq. mi.
WALIA VALLEY RIVER BASIN--Continued											
402	Touchet River near Touchet, Wash.	726	1941-48	Feb. 26, 1948	10.07	4,850	-	Moan May 9	7.51	2,510	3.46
UMATILLA RIVER BASIN											
403	Umatilla River above Meacham Creek, near Gibbon, Oreg.	125	1933-48	Dec. 12, 1946	8.84	6,660	53.3	1 p.m. May 22	6.88	3,380	27.0
404	Umatilla River at Pendleton, Oreg.	637	1891-92, 1903-5, 1921-48	Dec. 12, 1946	brd 4.5	13,700	21.5	8 to 10 p.m. May 22	5.70	6,970	10.9
405	Umatilla River at Yonah, Oreg.	1,280	1903-48	May 30, 1906	mp 15.0	20,000	15.6	11 p.m. May 22	7.02	6,430	5.02
406	Umatilla River near Umatilla, Oreg.	2,290	1903-48	May 31, 1906	11.0	19,600	8.56	8 p.m. May 23	6.26	6,080	2.66
407	McKay Creek near Pilot Rock, Oreg.	178	1921-48	Apr. 1, 1931	10.4	6,000	33.7	5:30 a.m. May 13	4.35	1,140	6.40
408	McKay Creek near Pendleton, Oreg.	236	1918-48	Feb. 10, 1921	10.4	3,250	13.8	2 to 3 p.m. May 13	2.68	1,270	5.38
409	Birch Creek at Blath, Oreg.	291	1921-23, 1927-48	Jan. 29, 1928	16.00	1,640	5.64	8 a.m. May 14	4.70	760	2.61
410	Butter Creek near Pine City, Oreg.	291	1921-48	Jan. 28, 1942	7.91	1,600	5.50	May 19	2.70	261	.90
411	Unnamed tributary No. 1 of Butter Creek near Echo, Oreg.	1.42	-	-	-	-	-	p.m. June 9	-	5,260	3,700
412	Unnamed tributary No. 2 of Butter Creek near Echo, Oreg.	.33	-	-	-	-	-	p.m. June 9	-	1,180	3,580
WILLOW CREEK BASIN											
413	Black Horse Creek near Lexington, Oreg.	17.0	-	-	-	-	-	p.m. June 9	-	750	44.1
414	Black Horse Creek at Lexington, Oreg.	23.4	-	-	-	-	-	p.m. June 9	-	900	38.5
JOHN DAY RIVER BASIN											
415	John Day River at Prairie City, Oreg.	231	1926-48	Mar. 19, 1932	14.7	1,550	6.71	11:30 a.m. May 28	5.11	1,150	4.98
416	John Day River at Picture Gorge, near Dayville, Oreg.	1,640	1926-48	Mar. 19, 1932	14.0	6,000	3.66	9 a.m. May 22	13.72	6,520	3.98
417	John Day River at Service Creek, Oreg.	5,090	1929-48	Mar. 19, 1932	16.75	28,900	5.68	Moan May 22	15.25	23,900	4.70
418	John Day River at McDonald Ferry, Oreg.	7,580	1904-48	Mar. 20, 1932	10.62	26,800	3.54	2:30 p.m. May 23	9.83	23,000	3.03
Slope area and computation of flow over road and through culvert											
Slope area											
Average of two slope-area and one contracted-opening measurements											

Slope area and computation of flow over road and through culvert

Slope area

Do.

Average of two slope-area and one contracted-opening measurements

	7.2	1930-48	June 9, 1933	2.44	150	20.8	5 a.m. June 8	2.23	172	21.9	Slope area
419 Strawberry Creek above Slide Creek, near Fairlie City, Oreg.	88	-	-	-	-	-	-	-	600	6.82	Do.
420 Canyon Creek near John Day, Oreg.	569	-	-	-	-	-	-	-	3,290	5.52	Do.
421 South Fork John Day River near Dayville, Oreg.	525	1929-48	May 14, 1932	8.4	4,990	9.50	11 p.m. May 26	10.48	8,170	15.6	
422 North Fork John Day River near Dale, Oreg.	2,520	1925-48	Mar. 18, 1932	14.8	22,000	8.73	3 a.m. May 22	14.67	21,100	8.37	
423 North Fork John Day River at Monument, Oreg.	121	1914-17, 1919-24, 1932-48	Dec. 12, 1946	4.58	2,350	19.4	6 a.m. May 13	3.68	1,090	9.01	
424 Canas Creek near Uliab, Oreg.	526	1929-48	Mar. 19, 1932	7.78	4,000	7.60	4 a.m. May 28	6.37	2,500	4.75	
425 Middle Fork John Day River at Ritter, Oreg.	92	1930-48	Mar. 18, 1932	4.55	800	8.70	2 a.m. May 22	5.84	1,850	20.1	Do.
426 Fox Creek at gorge, near Fox, Oreg.	171	-	-	-	-	-	-	-	4,520	26.4	
427 Thirtymile Creek below Gondon Canyon, near Gondon, Oreg.	518	-	-	-	-	-	-	-	763	1.47	Dam
DESCHUTES RIVER BASIN											
428 Deschutes River below Snow Creek, near Lapine, Oreg.	-	1937-48	Aug. 31, 1943	2.42	362	-	4 p.m. June 10	1.74	216	-	
429 Deschutes River at Crane Prairie, near Lapine, Oreg.	244	1914-17, 1922-48	July 28, 1947	3.34	41,170	4.89	May 26, June 11-13	1.33	4203	.83	
431 Deschutes River at Benham Falls, near Bend, Oreg.	-	1906-13, 1920-21, 1924-48	Nov. 27, 1909	-	405,000	-	Mo. to 11 p.m. June 14	3.50	2,010	-	
432 Deschutes River near Madras, Oreg.	-	1927-48	Jan. 1, 1943	6.89	13,300	-	8 to 10 a.m. May 27	3.94	7,010	-	
433 Deschutes River at Moody, near Biggs, Oreg.	10,500	1897-99, 1906-48	Jan. 7, 1923	10.2	43,600	4.15	12 p.m. May 27	4.13	10,300	.98	
434 Odell Creek near Crescent, Oreg.	39	1911-14, 1923-24, 1933-48	Dec. 30, 1945	1.37	405	10.4	10 a.m. June 2	1.09	266	6.82	
435 Tumalo Creek near Bend, Oreg.	57	1906-48	Jan. 6, 1923	4.55	1,420	24.9	12:30 a.m. June 10	3.71	786	13.8	
436 Squaw Creek near Sisters, Oreg.	63	1911-48	Nov. 22, 1909	48.75	1,130	17.9	7 p.m. June 9	3.07	494	7.84	
437 Crooked River near Post, Oreg.	2,160	1908-11, 1939-48	Dec. 2, 1941	3.33	6,190	2.87	1 a.m. May 21	4.47	2,370	1.10	
438 Crooked River above Hoffman Dam, near Prineville, Oreg.	2,810	1908-12, 1913-14, 1940-48	Mar. 1, 2, 1910	49.4	9,080	3.23	4 a.m. May 27	5.67	3,700	1.32	
439 Crooked River near Oliver, Oreg.	4,330	1917-48	Mar. 30, 31, 1943	46.70	8,260	1.91	6 a.m. May 27	5.51	3,940	.91	

bq Estimated.

by Maximum flood known, 17,000 second-foot Dec. 14, 1882, furnished by Corps of Engineers.

by Maximum stage known, 12.6 feet, probably in 1894.

n From floodmark.

o Site datum than in use.

p Affected by regulation.

v Varied.

ac Observed.

Table 3.—Summary of flood stages and discharges—Continued

No. on map	Stream and place of determination	Drainage area (sq.mi.)	Period of record	Maximum previously known				Maximum during May-June 1948			
				Date	Stage height (feet)	Discharge (sec.-ft.)	Sec.-ft. per sq. mi.	Date and hour	Stage height (feet)	Discharge (sec.-ft.)	Sec.-ft. per sq. mi.
DESCHUTES RIVER BASIN—Continued											
440	South Fork Beaver Creek near Paulina, Oreg.	90	1944-48	Dec. 28 or 29, 1945	6.00	bs900	10.0	6:30	ac6.40	bs950	10.6
441	Beaver Creek near Paulina, Oreg.	425	1941-48	Dec. 28, 1945	10.2	4,310	10.1	7 p.m. May 21	3.66	997	2.35
442	North Fork Beaver Creek near Paulina, Oreg.	70	1942-48	Dec. 28, 1945	5.90	899	12.8	1 a.m. May 27	3.89	489	6.99
443	North Fork Crooked River above Deep Creek, near Paulina, Oreg.	159	1941-48	Apr. 7, 1943	4.17	2,060	13.0	12 p.m. June 3	2.98	760	4.78
444	North Fork Crooked River below Deep Creek, near Paulina, Oreg.	264	1946-48	Apr. 20, 1948	6.52	2,080	7.88	12:45 p.m. June 3	6.35	1,950	7.39
445	Melotius River near Grandview, Oreg.	324	1921-48	Jan. 7, 1923	3.32	5,780	17.8	11:20 p.m. May 28	.90	1,920	5.93
446	Lake Creek near Sisters, Oreg.	20.5	1911-13, 1915-48	Jan. 10, 1923	2.58	302	14.7	11:30 p.m. June 1	2.27	136	6.63
447	White River near Wapinitia, Oreg.	115	1941-48	Dec. 15, 1946	6.43	3,620	31.5	8:30 p.m. May 26	3.87	1,140	9.91
448	White River below Tygh Valley, Oreg.	393	1917-48	Jan. 6, 1923	13.3	13,300	33.8	9 p.m. May 26	5.50	2,650	6.74
449	Clear Creek near Government Camp, Oreg.	8.9	1946-48	Dec. 15, 1946	3.00	150	16.9	1 to 4 p.m. May 29	2.33	88	9.89
FIFTEENMILE CREEK BASIN											
450	Fifteenmile Creek near Wrentham, Oreg.	171	1946-48	Jan. 7, 1948	6.34	877	5.13	7:45 p.m. June 13	5.40	623	3.64
451	Eightmile Creek near Boyd, Oreg.	56	1946-48	June 7, 1947	6.55	-	-	7 p.m. June 13	3.23	62	1.11
KLICKITAT RIVER BASIN											
452	Klickitat River above West Fork, near Glenwood, Wash.	151	1944-48	May 17, 1946	3.28	1,710	-	1:30 p.m. May 27	4.28	3,090	20.5
453	Klickitat River near Glenwood, Wash.	360	1909-48	Dec. 22, 1933	7.9	9,870	-	11 p.m. May 26	7.00	5,190	14.4
454	Klickitat River near Pitt, Wash.	1,170	1909-11, 1928-48	Dec. 22, 1933	112.5	ac21,000	-	9:30 a.m. May 27	7.65	6,860	5.86
455	West Fork Klickitat River near Glenwood, Wash.	87	1910, 1916, 1944-48	Dec. 14, 1946	3.52	1,180	-	10 p.m. May 26	4.23	1,580	18.2
456	Big Muddy Creek near Glenwood, Wash.	22.5	1916-18, 1944-48	Oct. 19, 1947	8.75-39	1,290	-	9 p.m. June 8	4.75	1,180	5.24
457	Little Klickitat River near Goldendale, Wash.	ak81	1946-48	Jan. 6, 1948	5.55	1,660	-	3 a.m. May 27	2.60	159	1.96
458	Little Klickitat River near Wabkiacus, Wash.	ak281	1944-48	Dec. 28, 1945	9.00	ac3,640	-	8:20 a.m. May 28	3.57	ac312	1.11



Table 3.—Summary of flood stages and discharges—Continued

No. on map	Stream and place of determination	Drainage area (sq.mi.)	Period of record	Maximum previously known				Maximum during May-June 1948				
				Date	Gage height (feet)	Discharge (sec.-ft.)	Sec.-ft. per sq. mi.	Date and hour	Gage height (feet)	Discharge (sec.-ft.)	Sec.-ft. per sq. mi.	Method of determination
<b>WASHOUGAL RIVER BASIN</b>												
477	Washougal River near Washougal, Wash.	108	1944-48	Dec. 11, 1946	14.20	ac21,500	-	4:30 p.m. May 3	6.73	ac3,880	35.9	
478	Willamette River at Salem, Oreg.	7,280	1909-16, 1927-48	Nov. 25, 1909	30.5	ca315,000	43.3	2 to 3 p.m. May 5	7.29	48,500	6.66	
479	Willamette River at Portland, Oreg.	11,200	1879-1948	June 7, 1894	33.0	-	-	2 to 4 a.m. June 14	29.975	-	-	
480	Hill Creek at Salem, Oreg. <u>cb</u>	108	1938-48	Feb. 7, 1943	25.53	1,110	10.3	8 a.m. May 4	2.82	4,340	3.98	
481	South Yamhill River at Whiteoak, Oreg.	502	1940-48	Jan. 7, 1948	42.12	24,500	48.8	11:30 a.m. May 4	21.03	4,340	8.65	
482	North Yamhill River near Pike, Oreg.	48	1940-48	Dec. 18, 1941	8.24	3,830	79.8	12:30 p.m. May 3	3.45	610	12.7	
483	Molalla River near Canby, Oreg.	323	1928-48	Jan. 7, 1948	14.9	25,100	77.7	10:30 p.m. May 3	6.19	4,380	13.6	
484	Pudding River at Aurora, Oreg.	493	1928-48	Dec. 30, 1937	cc24.5	419,400	39.4	6:20 p.m. May 7	10.64	2,760	5.60	
485	Avalatin River near Willamette, Oreg.	710	1928-48	Dec. 23, 1933	17.72	23,300	32.8	2 to 10 p.m. May 8	7.55	3,420	4.82	
486	Clackamas River near Casadero, Oreg.	665	1909-48	Mar. 31, 1931	f556.5	60,800	91.4	May 3	-	cd7,400	11.1	
487	Johnson Creek at Sycamore, Oreg.	28.2	1940-48	Jan. 7, 1948	13.06	1,820	64.5	6:30 a.m. May 6	5.12	336	11.9	
<b>LEWIS RIVER BASIN</b>												
488	Lewis River at Ariel, Wash.	731	1909, 1922-48	Dec. 22, 1933	m35.0	129,000	-	7 p.m. May 6	10.12	16,500	22.6	
489	West Fork Lewis River near Heison, Wash.	125	1922-48, 1929-48	Dec. 22, 1933	12.3	15,600	-	6 a.m. May 6	6.09	3,330	26.6	
<b>KALAMA RIVER BASIN</b>												
490	Kalama River below Italian Creek near Kalama, Wash.	195	1946-48	Dec. 13, 1946	13.40	ac14,400	-	6 p.m. May 6	7.84	5,340	27.4	
<b>COMITZ RIVER BASIN</b>												
491	Cowlitz River at Castle Rock, Wash.	2,240	1926-48	Dec. 23, 1933	31.6	139,000	-	5 to 6 p.m. May 28	15.56	30,000	13.4	

KLOKOMIN RIVER BASIN											
492	Klokomin River near Cathlamet, Wash.	66	1940-46	Jan. 25, 1947	ca 0.76	6,210	-	2130 a.m. May 6	6.20	1,630	24.7
YOUNGS RIVER BASIN											
493	Younge River near Astoria, Oreg.	32	1927-46	Nov. 24, 1927	na 6.52	6,300	197	1130 a.m. May 6	5.96	708	22.1
f Elevation above mean sea level.											
g From floodmark.											
h Site and datum then in use.											
i Affected by regulation.											
j Revised.											
ac Observed.											
ca Maximum discharge known, 500,000 second-feet Dec. 4, 1861 (stage height, about 39 feet).											
cb Some water diverted above station.											
cc Maximum stage known, 25.0 feet Jan. 9, 1923 (discharge, 20,700 second-feet).											
cd Computed on basis of records for station above Three Lynx Creek.											
ce Maximum stage known, 17.2 feet December 1933.											



## FLOOD-CREST STAGES

Records of flood-crest stages were collected by the Corps of Engineers. Field surveys were not completed at the time of preparation of this report; however, all records already collected were made available to the Geological Survey. These data, together with a few observations by other agencies, are given in table 4. Such records are of special interest in presenting a limiting factor with respect to future developments along rivers and in furnishing basic information as to velocity of transmission of flood crests, valley or channel storage, the effects of natural or artificial channel constrictions, and other aspects of river behavior.

The table describes the observation points by reference to local features measured along the banks and river distances above the mouth. The date and time of crest are given where known and the elevation of the crest at the observation point. It has been found that the crests of floods within the building limits of cities and towns and at other places more or less distant from a river may be materially different from those along the main river channel, as a result of various factors. Consequently, inconsistencies may occasionally appear to exist between local information and the records herein published. Flood crests on opposite banks of a stream are frequently at different elevations owing to the effect of bends and obstructions in the channel.

Table 4.--Flood-crest stages  
 [Furnished by Corps of Engineers except as noted]

Stream and location	Miles above mouth	Day and hour 1948	Altitude in feet
<b>COLUMBIA RIVER MAIN STEM</b>			
Columbia River:			
Ringold Station, Wash.	353.6	June 12 12 pm	376.5
Ringold, Wash., 1 mile below, left bank	352.6		373.7
Ringold, Wash., 2.1 miles below, left bank	351.5		371.2
Ringold, Wash., 3.4 miles below, left bank	350.2	June 12 12 p.m.	369.9
Byers Landing, Wash., 2.70 miles above, left bank	348.1		367.6
Byers Landing, Wash., 0.90 mile above, left bank	346.3		365.3
Byers Landing, Wash., 0.60 mile below, left bank	344.8		364.4
Byers Landing, Wash., 2.50 miles below, left bank	343.0	June 12 4 pm	361.9
Byers Landing, Wash., 4.8 miles below, left bank	340.7		359.6
Byers Landing, Wash., 6.1 miles below, left bank	339.4		358.5
Merwin Ferry, Wash., 2.5 miles above, left bank	338.4		356.9
Merwin Ferry, Wash., 1.2 miles above, left bank	337.1		355.4
Merwin Ferry, Wash., slip, left bank	335.9		353.5
Merwin Ferry, Wash., 1.2 miles below, left bank	334.7		351.8
Merwin Ferry, Wash., 2.3 miles below, left bank	333.6	June 12 4 pm	350.8
Highway bridge, 3.50 miles above, left bank	331.5	June 12 4 pm or May 31 4 am	347.9
Highway bridge, 1.8 miles above, left bank	329.8		346.2
Northern Pacific Ry. bridge, left bank	328.0		344.2
Snake River, 2.3 miles above mouth, left bank	326.5		342.3
Snake River, 0.8 mile above mouth of, left bank	325.0		341.5
Oregon-Washington R. R. & Navigation Co. bridge, 0.1 mile below, left bank	323.1		335.7
Oregon-Washington R. R. & Navigation Co. bridge, 1.0 miles below, left bank	322.2		332.0
Oregon-Washington R. R. & Navigation Co. bridge, 2.5 miles below, left bank	320.7	May 30 9 pm	329.3
Atalia pumping station, 2.3 miles above, left bank	318.4		327.1
Atalia pumping station, 1.0 mile above, left bank	317.1		323.3
Walla Walla River, mouth of, left bank	313.7		319.1
Walla Walla River, 0.4 mile below mouth, left bank	313.2	May 30 10 pm	318.1
Walla Walla River, 0.9 mile below mouth, left bank	312.7		317.0
Walla Walla River, 1.3 miles below mouth, left bank	312.3		316.6
Walla Walla River, 2.6 miles below mouth, left bank	311.0		315.3
Spring Gulch, mouth of, left bank	310.5		313.8
Spring Gulch, 0.5 mile below mouth, left bank	310.0		313.2
Spring Gulch, 1.0 mile below mouth, left bank	309.5		312.9
Spring Gulch, 1.6 miles below mouth, left bank	308.9	May 30 11 pm	312.0
Left bank	308.4		311.3
Left bank	307.9		310.8
Left bank	307.4		310.2
Juniper Canyon bridge, 1.9 miles above, left bank	307.0		309.8
Juniper Canyon bridge, 1.0 mile above, left bank	306.1		308.5
Juniper Canyon bridge, 0.5 mile above, left bank	305.6		308.3
Juniper Canyon bridge, left bank	305.1		307.1
Juniper Canyon bridge, 0.5 mile below, left bank	304.6		306.2
Juniper Canyon bridge, 1.0 mile below, left bank	304.1		306.0
Juniper Canyon bridge, 1.5 miles below, left bank	303.6		305.4
Juniper Canyon bridge, 2.0 miles below, left bank	303.1		305.1
Juniper Canyon bridge, 3.2 miles below, left bank	301.9		304.9
Juniper Canyon bridge, 3.9 miles below, left bank	301.2	May 30 12 pm	304.5
Cold Springs R. R. station, 0.6 miles above, left bank	300.1		304.4
Cold Springs R. R. station, left bank	299.5		301.2
Cold Springs, 0.7 mile below mouth, left bank	297.4		300.4
Cold Springs, 2.3 miles below mouth, left bank	296.6		296.2
Cold Springs, 2.7 miles below mouth, left bank	296.2		295.3
McNary Dam, 3.9 miles above, left bank	295.8		294.1
McNary Dam, 3.5 miles above, left bank	295.4	May 31 1 am	293.6
McNary Dam, 3.1 miles above, left bank	295.0		292.9
McNary Dam, 2.5 miles above, head of Upper Umatilla Rapids, left bank	294.4		290.5
Upper Umatilla Rapids, left bank	294.0		289.3
Upper Umatilla Rapids, foot of, left bank	293.6		287.9
Left bank	293.0		286.7
Lower Umatilla Rapids, left bank	292.7		285.9

Table 4.--Flood-crest stages--Continued

Stream and location	Miles above mouth	Day and hour 1948	Altitude in feet
COLUMBIA RIVER MAIN STEM--Continued			
Columbia River--Continued			
Lower Umatilla Rapids, left bank	292.2	May 31 2 am	a284.2
Lower Umatilla Rapids, McNary Dam axis, left bank	291.8		a280.0
Lower Umatilla Rapids, left bank	291.2		278.8
Umatilla, Oreg., left bank	290.2		278.6
Left bank	289.5		277.7
Umatilla, Oreg., staff gage at grain elevator	289.3	May 31 3 am	b277.0
Umatilla River, bridge over mouth	288.5		276.9
Left bank	288.1		275.7
Left bank	287.2		274.4
Left bank	286.6		274.2
Devels Bend Rapids, head of, left bank	286.2		273.3
Devels Bend Rapids, middle of, left bank	285.6		272.9
Left bank	285.0		270.9
Devels Bend Rapids, foot of, left bank	284.5		270.0
Left bank	283.8		269.4
Left bank	283.3		268.2
Left bank	282.8		267.9
Left bank	282.4		266.8
Irrigon, Oreg., left bank	281.8		266.3
Left bank	281.2		265.0
Left bank	280.7	May 31 4 am	263.4
Left bank	280.1		263.0
Left bank	279.6		262.2
Left bank	279.1		261.8
Left bank	278.1		261.2
Left bank	276.8		260.5
Left bank	276.4		259.3
Left bank	275.8		258.3
Left bank	275.1		257.4
Left bank	274.3		256.3
Left bank	273.6		255.8
Left bank	273.1		255.3
Left bank	272.8		254.6
Left bank	272.3		254.0
Left bank	271.8		253.4
Coyote, Oreg., left bank	271.0		252.3
Left bank	270.5		251.2
Left bank	270.0		250.8
Left bank	269.5		249.4
Left bank	269.1		248.9
Boardman, Oreg., left bank	268.5		249.0
Left bank	267.9	May 31 5 am	247.4
Left bank	267.2		246.4
Left bank	266.8		246.1
Left bank	266.4		245.1
Canoe Encampment Rapids, head of, left bank	265.9		244.9
Canoe Encampment Rapids, left bank	265.4	May 31 6 am	244.3
Canoe Encampment Rapids, middle of, left bank	264.8		242.9
Canoe Encampment Rapids, foot of, left bank	264.3		242.5
Left bank	263.7		241.8
Left bank	262.7		240.3
Castle Rock, Oreg.	262.2		239.8
Left bank	261.2		239.1
Left bank	260.7		239.0
Left bank	260.2		237.8
Six Mile Canyon, mouth of, left bank	258.7		236.1
Left bank	258.3		235.6
Left bank	257.9		235.2
Alderdale Ferry, left bank	256.9		234.4
Left bank	256.3		233.5
Left bank	254.9		232.0
Left bank	254.5		231.7
Left bank	254.0		230.9
Left bank	253.5		230.1
Left bank	253.0		229.3
Heppner Junction, Oreg., railroad bridge across Willow Creek, left bank	252.5	May 31 7 am	228.4
Left bank	252.0		228.0
Left bank	251.5		227.7
Left bank	251.0		226.9
Willows, Oreg., left bank	250.6		226.7
Left bank	250.0	May 31 7 am	226.5
Left bank	249.4		225.3

a Affected by McNary cofferdam.

b Furnished by U. S. Weather Bureau.

Table 4.--Flood-crest stages--Continued

Stream and location	Miles above mouth	Day and hour 1948	Altitude in feet
COLUMBIA RIVER MAIN STEM--Continued			
Columbia River--Continued			
Left bank	249.0		224.8
Left bank	248.6		224.5
Left bank	248.2		223.1
Left bank	247.5		222.8
Left bank	247.0		222.3
Left bank	246.5		222.1
Left bank	246.0		221.4
Left bank	245.6	May 31 8 am	220.3
Left bank	245.0		219.9
Left bank	244.4		219.3
Left bank	243.8		218.6
Left bank	243.3		218.0
Left bank	242.8		217.3
Left bank	242.2		217.2
Arlington, Oreg., mouth of Alkali Canyon, left bank	241.6		217.0
Left bank	241.3		215.5
Owyhee Rapids, head of, left bank	240.9		214.4
Owyhee Rapids, left bank	240.4		213.9
Owyhee Rapids, mouth of Jones Canyon, left bank	239.9		213.6
Owyhee Rapids, left bank	239.4		213.2
Owyhee Rapids, left bank	238.9		212.8
Owyhee Rapids, left bank	238.5	May 31 9 am	211.8
Left bank	237.9		210.9
Left bank	237.3		210.5
Lang Canyon, mouth of, left bank	236.9		209.9
Left bank	236.3		209.1
Blalock Rapids, head of, left bank	235.9		208.3
Left bank	235.3		208.1
Left bank	234.9		207.6
Blalock Rapids, left bank	234.4		206.6
Left bank	233.9		206.5
Blalock, Oreg., left bank	233.4		206.2
Four O'Clock Rapids, head of, left bank	233.0		205.8
Four O'Clock Rapids, left bank	232.4		205.5
Four O'Clock Rapids, foot of, left bank	231.9		205.2
Left bank	231.4		204.2
Left bank	230.9		203.5
Left bank	230.5	May 31 10 am	203.3
Left bank	230.0		202.9
Left bank	229.5		201.9
Left bank	229.0		201.2
Rock Creek Rapids, left bank	228.4		200.0
Rock Creek Rapids, foot of, left bank	227.9		199.9
Left bank	227.3		199.5
Left bank	226.8		198.6
Left bank	226.4		197.0
Left bank	225.9		195.7
Left bank	224.9		194.3
Left bank	224.5		193.5
Left bank	224.0		192.5
Squally Hook Rapids, left bank	223.5		191.9
Squally Hook Rapids, left bank	222.8	May 31 11 am	190.7
Squally Hook Rapids, foot of, left bank	222.2		188.9
Left bank	221.7		188.7
Left bank	221.2		188.4
Left bank	220.6		187.0
Indian Rapids, head of, left bank	220.2		186.6
Indian Rapids, foot of, left bank	219.7		185.4
Left bank	219.1		184.3
Left bank	218.5		183.9
John Day River, mouth of, Upper John Day Rapids, left bank	217.9		183.1
Middle John Day Rapids, head of, left bank	217.5		182.7
Middle John Day Rapids, left bank	217.0		179.9
Left bank	216.5		179.3
Lower John Day Rapids, left bank	216.0		178.9
Left bank	215.5	May 31 Noon	177.4
Schofield Rapids, left bank	215.1		176.9
Left bank	214.6		176.2
Left bank	214.1		175.4
Girklng Canyon, mouth of, left bank	213.6		174.5
Rufus, Oreg.	213.0		174.0
Left bank	212.6		173.2
Left bank	212.1		173.0
Left bank	211.6		172.4
Left bank	211.1		171.7

Table 4.--Flood-crest stages--Continued

Stream and location	Miles above mouth	Day and hour 1948	Altitude in feet
COLUMBIA RIVER MAIN STEM--Continued			
Columbia River--Continued			
Left bank	210.6		171.3
Grant, Oreg., staff gage at gaging-cable tower, left bank	210.3		170.3
Grant, Oreg., at ferry landing, left bank	210.1		170.1
Left bank	209.7		169.8
Left bank	209.1		168.8
Spanish Hollow, mouth of, left bank	208.6		167.8
Biggs Rapids, head of, left bank	208.1	May 31 1 pm	167.5
Biggs Rapids, left bank	207.4		167.1
Biggs Rapids, foot of, left bank	206.9		166.7
Left bank	206.0		165.9
Left bank	205.7		165.6
Left bank	205.3		164.4
Left bank	204.9		163.8
Left bank	204.6		162.2
Left bank	204.2		161.7
Left bank	203.8		161.2
Deschutes River, mouth of, left bank	203.4		159.5
Left bank	203.1		159.0
Left bank	202.7		157.9
Left bank	202.1		157.0
Left bank	201.5	May 31 2 pm	155.8
Celilo, Oreg., Geological Survey gage, left bank	201.1	May 31 2 pm	154.5
Celilo, Oreg., from recorder graph, left bank	201.1	May 31 1:30, 3, 6:30 pm	154.56
The Dalles-Celilo Canal, left bank	200.9		154.5
The Dalles-Celilo Canal, left bank	200.5		153.8
The Dalles-Celilo Canal, left bank	200.0		152.4
The Dalles-Celilo Canal, left bank	199.5		150.9
The Dalles-Celilo Canal, left bank	198.9		149.8
The Dalles-Celilo Canal, left bank	198.5		149.2
The Dalles-Celilo Canal, left bank	198.0		148.4
The Dalles-Celilo Canal, left bank	197.5		147.7
The Dalles-Celilo Canal, left bank	197.0		146.8
The Dalles-Celilo Canal, left bank	196.5		146.5
The Dalles-Celilo Canal, left bank	195.9		146.1
The Dalles-Celilo Canal, left bank	195.4		146.1
The Dalles-Celilo Canal, left bank	194.9		145.7
The Dalles, Oreg., staff gage, left bank	189.3	May 31 6:30 pm	98.71
Granddallies, Wash., right bank	189.0	May 31 3 pm	98.0
Left bank	187.8		96.9
Left bank	185.8		95.3
Left bank	183.7		94.2
Right bank	183.7		95.8
Rowena, Oreg., left bank	181.1		94.5
Lyle, Wash., right bank	180.4		94.8
Left bank	177.9		93.4
Left bank	176.2		91.8
Mosier, Oreg., left bank	174.7		91.7
Mosier Creek, mouth of, left bank	173.4		91.5
Left bank	171.0		90.7
Hood River, White Salmon Bridge, left bank	169.5	June 2 6 pm	91.0
Left bank	167.6		89.9
Left bank	165.1		89.3
Mitchell Point, Oreg., left bank	163.6		88.9
Across Columbia River from Cooks, Wash., left bank	161.5		88.5
Left bank	159.9		87.9
Lindsey Creek, (backwater), mouth of, left bank	158.6		87.8
Left bank	156.5		87.4
Left bank	152.5		86.7
Herman Creek, mouth of, left bank	150.8		87.7
Cascade Locks, Oreg., left bank	148.9	May 29 12 pm June 2 3 to 6 pm	88.1
Eagle Creek, mouth of, left bank	146.1	May 21,23, 24,25,26, 27	83.0
Bonneville Dam, powerhouse, forebay, left bank	145.3	May 21,23, 24,25,26, 27	82.50

c Observed by Geological Survey.

Note.- Stage between river miles 189.3 and 145.3 affected by backwater from Bonneville Dam.

Table 4.--Flood-crest stages--Continued

Stream and location	Miles above mouth	Day and hour 1948	Altitude in feet
COLUMBIA RIVER MAIN STEM--Continued			
Columbia River--Continued			
Bonneville Dam, tailwater, left bank	145.2	May 31 2 pm	48.7
Moffett Creek, mouth of, left bank	143.3	May 31 3 pm	44.2
Warrendale, Oreg., left bank	141.8	May 31 4 pm	43.1
Warrendale, Oreg., left bank	141.5		43.2
Dodson, Oreg., left bank	140.2	May 31 5 pm	41.5
Dodson, Oreg., left bank	139.7		42.3
Horsetail Falls, Oreg., left bank	138.2	May 31 6 pm	42.1
Multnomah Falls, Oreg., left bank	135.8	May 31 8 pm	41.7
Bridal Veil, Oreg., left bank	131.8		41.1
Bridal Veil, Oreg., left bank	131.8	May 31 10 pm	41.5
Left bank (backwater)	129.2	May 31 11 pm	40.3
Rooster Rock, Oreg. (backwater), left bank	128.7		40.1
Mount Pleasant, Wash., right bank	128.7	May 31 12 pm	39.9
Tunnel Point, Oreg., left bank	127.5		40.2
Corbett, Oreg., left bank	126.8	June 1 1 am	39.6
Taylor, Oreg., left bank	125.9		39.8
Left bank	124.6	June 1 2 am	39.2
Washougal, Wash., right bank	122.7	June 1 3 am	39.1
Railroad bridge over Sandy River, left bank	121.5		38.5
Parker Landing, Wash., right bank	121.6	June 1 4 am	38.8
Camas, Wash., Crown Willamette Paper Co. dock, right bank	120.3		37.9
Ione Reef, Oreg., left bank	119.8	June 1 5 am	37.7
Sandy Pump house, left bank	118.8	June 1 6 am	37.3
Smith Rock Quarry, Wash., right bank	116.1	June 1 7 am	36.2
Portland, Oreg., foot of Northeast 105th St., left bank	113.1	June 1 9 am	35.5
Elsworth Cannery dock, Wash., right bank	112.1	June 1 10 am	34.8
Vancouver, Wash., right bank	106.3	June 1 1 pm June 14 8 am	32.55
Left bank	105.4		32.0
Power-line crossing on Vancouver bar, left bank	104.2		31.5
Sauvies Island, head of, (Willamette River channel), left bank	102.3	June 1 1 pm June 13, 14	31.2
Sauvies Island, Kelley Point, mouth of Willamette River, left bank	101.3	June 1 1 pm	30.7
Sauvies Island, mouth of Dairy Creek, left bank	100.6	June 1 1 pm	30.4
Scappoose, Oreg., Multnomah channel, 1 mile below Johnson's landing, left bank	95.0	June 1 1 pm	29.7
Henric landing, Sauvies Island, left bank	90.1		28.7
St. Helens, Oreg., left bank	86.1		27.4
Left bank	83.7		26.6
Deer Island, left bank	80.2	June 13 1 pm	26.4
Martins Bluff, Wash., right bank	79.2		25.6
Coffin Rock, Oreg., left bank	73.0		22.7
Thayer Dock, Oreg., left bank	69.7		21.2
Rainier, Oreg., left bank	67.7		20.4
Dibblee dike, Oreg., left bank	64.6		18.8
Left bank	62.6		17.8
Mayger, Oreg., left bank	58.6		16.6
Bradbury, Oreg., Johns bridge, left bank	55.0	June 9 4 am	15.7
Beaver Dock, left bank	52.3	June 8 4 am	14.2
Webb-Midland drainage district gage, left bank	47.4	June 10 4:45 am June 9 4:30 am	12.5
Marshland, Oreg., opposite Cape Horn, Wash., left bank	46.3	June 10 4:45 am	12.9

Table 4.--Flood-crest stages--Continued

Stream and location	Miles above mouth	Day and hour 1948	Altitude in feet
COLUMBIA RIVER MAIN STEM--Continued			
Columbia River--Continued			
Westland Slough, Oreg., left bank	44.0	June 8, 9, 10 4 am	11.4
Garden Slough on Puget Island, left bank	40.0	June 9 4 am	10.4
Clifton, Oreg., left bank	35.5		9.5
Elokomin Slough, Wash., right bank	35.5	June 9 3 am	9.4
Right bank	35.0	June 10 3:35 am June 9 3 am	9.4
YAKIMA RIVER BASIN			
Yakima River:			
Irrigation dam, just above, right bank	17.9	May 31, 9 am	421.9
Irrigation dam, 1.6 miles below, right	16.3	May 31	402.8
Bridge near Grosscup Ranch, 1.3 miles above, right bank	14.4	May 31	394.4
Bridge near Grosscup Ranch, right bank	13.1	May 31	390.5
Bridge near Grosscup Ranch, 1.4 miles below, right bank	11.7	May 31	384.5
Van Geisen St. Bridge, right bank	8.3	May 31, 10 am	371.4
Van Geisen St. Bridge, 1.1 miles below, right bank	7.2	May 31	367.6
Right bank	5.4	May 31	361.3
Richland, Wash., highway bridge, 1.6 miles above	3.7	May 31, 11 am Noon	355.9
Richland, Wash., junction of Yakima Highway (in backwater), right bank	1.1	June 12, 4 pm	353.6
SNAKE RIVER BASIN			
Snake River:			
Right bank	141.7	May 29 5 pm	735.2
Right bank	141.0	May 29	734.1
Lewiston, Idaho, right bank	140.2	May 29	732.5
Lewiston, Idaho, right bank	140.0	May 29	731.1
Lewiston, Idaho, right abutment of highway bridge, right bank	139.6	May 29	730.9
Clarkston, Wash., under power line, left bank	139.0	May 29	728.5
Clarkston, Wash., left bank	138.3	May 29	726.1
Clarkston, Wash., right bank	137.3	May 29	722.8
Aipowa Ferry, 2.7 miles above, right bank	133.5	May 29	714.4
Clarkston, Wash., Geological Survey gage, right bank	132.5	May 29 6 pm	710.4
Moses, Wash., 1.0 mile above, right bank	130.3	May 29	703.8
Steptoe Creek, 0.5 mile below, right bank	127.7	May 29	696.0
Indian, Wash., 0.7 mile above, right bank	124.1	May 29	687.7
Right bank	121.3	May 29 7 pm	680.7
Bishop, Wash., 0.7 mile above Yakawawa Canyon, right bank	118.7	May 29	674.2
Truax, Wash., right bank	116.0	May 29	667.2
Truax, Wash., Truax Rapids, right bank	115.7	May 29	666.1
Granite Point Rapids, right bank	114.9	May 29	663.5
Granite Point, right bank	114.2	May 29	662.1
Granite Point, right bank	113.8	May 29	661.0
Granite Dam axis, 0.6 mile above road up Cluge Creek draw, right bank	113.6	May 29	660.5
Cluge Creek, mouth of, right bank	113.0	May 29 8 pm	659.5
Mayview, Wash., 0.2 mile above grain tramway, right bank	112.3	May 29	658.1
Mayview, Wash., 0.3 mile below grain tramway, right bank	111.8	May 29	656.7
Wawawai, Wash., 0.7 mile below, right bank	110.1	May 29	652.6
Log Cabin Island, opposite downstream end of, right bank	107.2	May 29	d643.0
Almota, Wash., near Ferry cable, right bank	103.3	May 29 9 pm	d632.1
Lower Ilia Rapids, railroad bridge, right bank	100.6	May 29	d623.8
Swift, Wash., 0.9 mile above, right bank	97.6	May 29	d616.1
Swift, Wash., railroad bridge, 1.2 miles below, right bank	94.8	May 29 10 pm	d609.2
Penawawa, Wash., railroad bridge, right bank	91.7	May 29	602.4
Purrington, Wash., 1.9 miles above, right bank	88.3	May 29	d592.5
Purrington, Wash., 1.1 miles below, right bank	85.2	May 29	d584.0
Central Ferry, Wash., 0.6 mile below, Central Ferry bridge, right bank	82.6	May 29 11 pm	d576.9
Ridpath, Wash., 2.7 miles above, right bank	79.7	May 29	d569.3
Ridpath, Wash., 1.1 miles below, right bank	75.9	May 29	d558.8
Little Goose damsite, right bank	75.3	May 29	d556.7
Little Goose damsite, right bank	74.6	May 29	d555.8

d Elevation of crest estimated from daily water-surface elevations

Table 4.--Flood-crest stages--Continued

Stream and location	Miles above mouth	Day and hour 1948	Altitude in feet
SNAKE RIVER BASIN--Continued			
Snake River--Continued			
Little Goose damsite, right bank	74.0	May 29	d554.2
Flagpole, Wash., 1.4 miles above, right bank	73.7	May 29 12 pm	d553.3
Little Goose damsite, 1.0 mile above Flagpole, Wash., right bank	73.3	May 30	d551.7
Little Goose damsite, 0.6 mile above Flagpole, Wash., right bank	72.9	May 30	d550.8
Little Goose Dam axis, 0.1 mile below Flagpole, Wash., right bank	72.2	May 30	d548.9
Little Goose damsite, 0.3 mile below Flagpole, Wash., right bank	72.0	May 30	d548.6
Flagpole, Wash., 0.6 mile below, right bank	71.7	May 30	d547.8
Right bank	71.2	May 30	544.2
Right bank	70.3	May 30	d543.4
Riparia, Wash., 2.7 miles above railroad bridge, right bank	69.8	May 30	d541.9
Riparia, Wash., 1.5 miles below, right bank	66.7	May 30	533.6
Tucannon River, 0.3 mile below mouth of, right bank	62.0	May 30	d516.0
Palouse River, mouth of, right bank	59.4	May 30	505.1
Oregon-Washington R. R. & Navigation Co. railroad bridge, 2.3 miles below, right bank	56.6	May 30	d495.4
Ayer, Wash., 1.0 mile above, right bank	53.6	May 30	d488.1
Ayer, Wash., 1.3 miles below, right bank	51.1	May 30	d480.0
Harder, Wash., 1.3 miles above, right bank	47.1	May 30	d470.1
Magallon, Wash., Monumental Dam axis, right bank	44.7	May 30	d460.4
Devils Canyon, mouth of, right bank	42.6	May 30	454.6
Windust, Wash., 2.0 miles above, right bank	40.7	May 30	450.3
Windust, Wash., 1.2 miles below, right bank	38.5	May 30	444.3
Burr Canyon, 0.8 mile above, right bank	36.6	May 30	438.6
Burr Canyon, 1.1 miles below, right bank	34.7	May 30	431.6
Right bank	32.6	May 30	425.6
Right bank	31.4	May 30	423.3
Walker, Wash., right bank	29.7	May 30	417.9
Simmons Rapids, right bank	28.0	May 30	415.4
Snake River Junction, Wash., 1 mile above, right bank	26.9	May 30	411.7
Copleys Cutoff Rapids, head of, right bank	24.9	May 30	406.9
Anchor Rapids, foot of, right bank	21.2	May 30	400.3
Page, Wash., right bank	19.5	May 30	394.2
Fish Hook Rapids, head of, right bank	18.0	May 30	390.9
Levey, Wash., 2.0 miles above, right bank	14.1	May 30	375.8
Levey, Wash., 0.8 mile below, right bank	11.9	May 30	371.1
Right bank	11.7	May 30	369.0
Gage Island Rapids, right bank	11.0	May 30	366.1
Ice Harbor damsite, right bank	10.5	May 30	363.9
Ice Harbor damsite, right bank	9.5	May 30	362.3
Ice Harbor damsite, right bank	9.0	May 30	361.9
Pasco, Wash., Geological Survey gage, right bank	6.3	May 30	353.5
Martindale, Wash., 5-mile damsite, right bank	6.0	May 30	350.8
Strawberry Island, head of, right bank	4.9	May 30	348.8
Strawberry Island, opposite, right bank	4.3	May 30	347.2
Strawberry Island, opposite, right bank	3.3	May 30	345.6
Highway bridge, right bank	2.2	May 30	343.4
Northern Pacific Ry. bridge, 0.4 mile below, right bank	1.1	May 30	341.7
Mouth, right bank	0	May 30	341.5
Grande Ronde River:			
Island City, Oreg., county road bridge, center pier	e128.25	May 22 5:35 pm	2,730.2
Island City, 1.4 miles east of, county road bridge, right bank	e126.75	May 22 5:25 pm	2,709.3
Island City, 4.1 miles east of, county road bridge, left bank	e124.18	May 22 5:15 pm	2,696.1
County road bridge, State ditch, right bank	e121.97	May 22 8:15 pm	2,691.1
County road bridge, left bank	e119.72	May 22 7:50 pm	2,685.1
Alicel, Oreg., 2 miles east of, county road bridge, left bank	118.65	May 23 4:45 pm	2,683.1
County road bridge, left bank	113.82	May 23 5 pm	2,680.9
Imbler, Oreg., 1 mile south of, county road bridge, left bank	109.85	May 23, 24,28,29	2,678.5

d Elevation of crest estimated from daily water-surface elevations.

e State ditch is present channel of Grande Ronde River above mile 118.72 and carried all flow of river during 1948 flood.



Table 4.--Flood-crest stages--Continued

Stream and location	Miles above mouth	Day and hour 1948	Altitude in feet
SNAKE RIVER BASIN--Continued			
Grande Ronde River--Continued			
Rhinehart, Oreg., 0.5 mile east of, county road bridge, left bank	104.80	May 24 10:40 am	2,675.5
Rhinehart, Oreg., 1.2 miles northeast of, Highway 82 bridge, left bank	103.30	May 29 11:45 am	2,672.9
Rondowa, Oreg., 500 feet below Wallowa River, Geological Survey gage, right bank	81.5	May 24 1:20 pm May 28 2 am	2,291.2
Catherine Creek f/ Union, Oreg., 6 miles southeast of	49.76	May 27 8:30 pm	3,086.6
Hot Lake, Oreg., 1.5 miles east of, on Highway 30 bridge, right bank	37.98	May 28 1:30 pm	2,705.3
County road bridge, left bank	34.86	May 27, 28, 29, 30	2,695.5
Highway 342 bridge, right bank	23.63	May 30 11:30 am	2,690.1
County road bridge, center of bridge	18.08		2,686.3
County road bridge, right bank	9.41	May 28 4:30 pm May 29 11 am	2,683.2
Confluence of Catherine Creek and State ditch	0		
Clearwater River:			
Orofino, Idaho, right bank	44.8		1,017.78
Myrtle, Idaho, highway bridge, right bank	18.2		852.4
Spalding, Idaho, right abutment of railroad bridge, right bank	12.0	May 29	796.8
Spalding, Idaho, Geological Survey gage on highway bridge, right bank	11.6	May 29 3 pm	c795.7
Potlatch Lumber Co. dam, 300 feet below, right bank	4.6	May 29	756.1
Potlatch Lumber Co. dam, 0.4 mile below, right bank.	4.2	May 29	753.3
Right bank	3.3	May 29	748.5
Lewiston, Idaho, north end 30th St., right bank	2.8	May 29	744.2
Lewiston, Idaho, east end 1st Ave., right bank	2.3	May 29	739.1
Lewiston, Idaho, 18th St. Bridge, right bank	1.8	May 29	735.7
Lewiston, Idaho, left bank	1.4	May 29	734.5
Lewiston, Idaho, left bank	.8	May 29 5 pm	732.5
WALLA WALLA RIVER BASIN			
Walla Walla River:			
Right bank	13.1		379.7
Right bank	12.6		377.8
Reese, Wash., right bank	12.1		375.0
Right bank	11.6		374.0
Right bank	11.2		370.9
Right bank	10.8		367.6
Right bank	10.3		365.0
Right bank	9.5		362.0
Right bank	8.9		358.2
Right bank	8.5		353.4
Right bank	7.9		352.9
Right bank	7.4		347.9
Right bank	6.6		342.2
Right bank	5.7		340.0
Right bank	5.2		333.4
Right bank	4.7		327.3
Right bank	4.1	May 30	320.4
Wallula, Wash., Union Pacific R. R. bridge, left bank	3.6	May 30	320.4
Left bank	.7	May 30	320.5
Walla Walla River, mouth of, left bank	0	May 30	320.0
WILLAMETTE RIVER BASIN			
Willamette River:			
Oregon City, Oreg., below Oregon City Falls, right bank	25.6	June 1, 14	31.0
Gladstone, Oreg., mouth of Clackamas River, right bank	24.3	June 1, 14	31.2
Jennings Lodge, Oreg., right bank	22.6	June 1, 14	30.9
Marylhurst College, left bank	21.5	June 1, 14	31.6
Oswego, Oreg., mouth of Oswego Creek, left bank	20.4	June 1, 14	31.6
Oswego, Oreg., Southern Pacific R. R. bridge, left abutment	19.5	June 1, 14	31.3

c Observed by Geological Survey.

f Catherine Creek flows in former Grande Ronde River channel; mouth is considered to be at point where State ditch returns to natural channel of Grande Ronde River at mile 118.7.

Table 4. --Flood-crest stages--Continued

Stream and location	Miles above mouth	Day and hour 1948	Altitude in feet
WILLAMETTE RIVER BASIN--Continued			
Willamette River--Continued			
Riverwood, Oreg., left bank	17.9	June 1, 14	31.2
Portland, Oreg., U. S. Weather Bureau gage at Morrison St. Bridge	12.6	June 14	g31.13
Portland, Oreg., foot of S.W. Stark St., left bank	12.5	June 1, 14	30.0
Portland, Oreg., government moorings, left bank	6.1	June 1, 14	30.0
Willamette River, mouth of, left bank	0	June 1, 14	31.3

g Furnished by Portland Harbor Patrol.

## STAGE RELATIONS, COLUMBIA RIVER NEAR INTERNATIONAL BOUNDARY

The effects of Grand Coulee Dam and the channel excavation of 1941-42 at the Little Dalles on the stages of the flood of 1948 at and near the international boundary are illustrated in figure 20. Franklin D. Roosevelt Lake was essentially full throughout the flood period. The following deductions concerning the flood of 1948 may be drawn from the diagram:

1. For discharges above about 430,000 second-feet, stages of Columbia River above the Little Dalles were lower than they would have been under natural conditions. The lowering in stage was apparently inappreciable at the international boundary.
2. For discharges above about 430,000 second-feet, stages of Columbia River at the international boundary were not affected by backwater from Franklin D. Roosevelt Lake. For discharges below about 430,000 second-feet, such backwater, if present at all, was inappreciable.

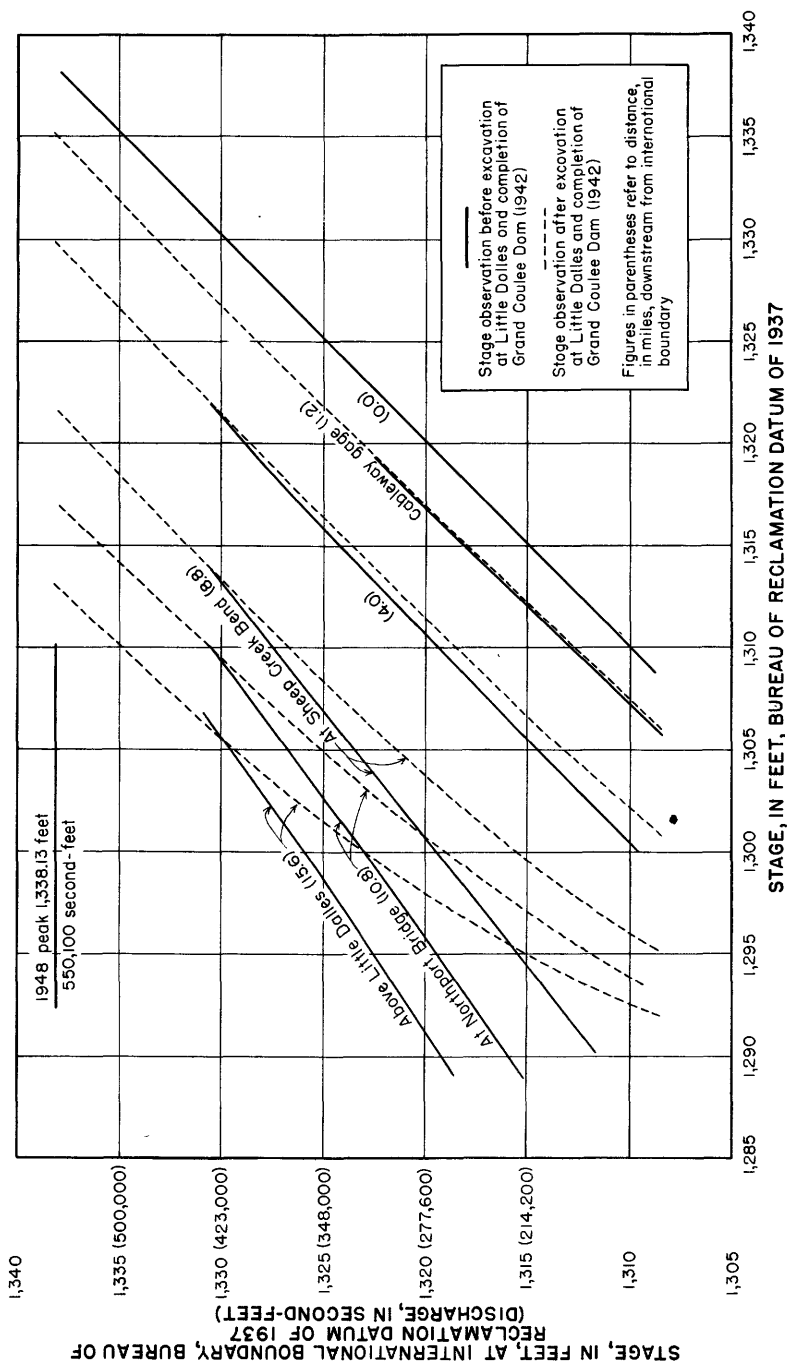


Figure 20.---Curves comparing stages of Columbia River near international boundary before and after completion of Little Dalles excavation and Grand Coulee Dam.





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#### ABSTRACT

The report presents in convenient form the existing data on flood magnitudes and frequencies at selected gaging stations in Columbia River Basin. The most commonly used methods of analyzing flood data and plotting flood frequencies are discussed briefly. There is no intention of suggesting the superiority of one method over another. For further information on frequency distributions, a list of references is furnished.

The main body of the report contains for each gaging station a brief description, a tabulation of all recorded floods, and frequency graphs computed by both the annual-flood and the partial-duration-series methods. An enveloping curve of flood discharge is also presented.

#### INTRODUCTION

In the relatively short period of time since white men settled in the Columbia River Basin a number of damaging floods have occurred. In spite of the diminution of average precipitation and runoff since 1900 flood damage seems to be increasing. A popular conception attributes the increasing damage to greater and more frequent floods. This appears to be an uncertain point, as accurate records of floods have not been kept for a sufficient length of time to be conclusive. It is probable that man's encroachment on the flood plains of rivers places more valuable property in the path of recurring floods.

From a practical engineering standpoint, a study of the economics of structures within reach of flood waters must include consideration of the possibility of damaging floods. Highway bridges and culverts must be designed to provide for the passage of flood flows. Provision for the passage of the greatest expected flood must be made in the design of dams and other important structures whose failure would cause loss of life or great economic loss. Where failure of the structure would result in only nominal property damage, a study of flood frequency provides a valuable tool for obtaining a balance between cost and damage or liability resulting from failure. Where great damage would be caused by failure, the danger involved in determining the "design" flood by extrapolation of flood frequency graphs cannot be overemphasized. The inherent errors of sampling when using short-term flood records are such that curves extrapolated beyond the range of data are of limited value. For design of dam spillways and similar important structures, the maximum possible discharge must be determined by methods that involve an analysis of such hydrologic factors as the physical characteristics of the drainage basin, maximum possible precipitation, and maximum rates of snow melt (Creager, Justin, and Hinds, 1944) 1/.

All of the existing data on flood magnitudes and frequencies at selected gaging stations in Columbia River Basin are presented in concise form. The stations were selected on the basis of length of record and absence of substantial artificial regulation or diversion.

The variations in the flood frequency graphs reflect differences in drainage basin

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1/ See p. 469 for list of references cited.

characteristics, such as size, shape, stream pattern, geology, vegetal cover, and channel storage, as well as differences in precipitation. The effect of these factors or influences on stream flow is complex, and short-cut formulas or procedures that take into account only a few of the many factors rarely give completely satisfactory results.

#### ADMINISTRATION AND ACKNOWLEDGMENTS

The data in this report were compiled and prepared for publication in the Tacoma, Wash., office of the branch of water utilization, Geological Survey, under the direction of C. C. McDonald, district engineer. The procedures used were outlined by R. W. Davenport, chief, and W. B. Langbein, hydraulic engineer, of the branch of water utilization.

The examination and compilation of the data and the preparation of the text and illustrations were done principally by S. E. Rantz and H. C. Riggs, hydraulic engineers. F. W. Kennon, hydraulic engineer, assisted in the preliminary work.

Determination of the flood peaks was made from original data in the files of the Helena, Mont., Boise, Idaho, Tacoma, Wash., and Portland, Oreg., districts of the surface water branch, Geological Survey. Grateful acknowledgment is made to the following district engineers of the surface water branch for cooperation in furnishing assistance in obtaining and checking data: In Montana, A. H. Tuttle; in Idaho, T. R. Newell; in Washington, F. M. Veatch; and in Oregon, G. H. Canfield prior to Aug. 31, 1948, and K. N. Phillips thereafter. Additional information was obtained from the files of the Washington Water Power Co., Spokane, Wash., and from the Bureau of Indian Affairs, Wapato, Wash. The cooperation and assistance of these organizations are gratefully acknowledged.

#### PHYSICAL FEATURES OF THE BASIN

Columbia River rises in the mountains of British Columbia and flows northwest for nearly 200 miles before it turns south--270 miles from where it crosses the boundary line between British Columbia and Washington. It turns west abruptly 112 miles south of the Canadian boundary and continues for more than 100 miles to the eastern foothills of the Cascade Range, which it follows southward to the mouth of Snake River. A few miles downstream from this junction, Columbia River again turns west and forms the boundary between Oregon and Washington all the way to the Pacific. Kootenai, Pend Oreille, and Spokane Rivers are tributaries draining parts of western Montana, northern Idaho, and British Columbia. From the west a number of streams heading in the Cascades contribute to Columbia River. Snake River, the largest tributary, drains practically all of southern and central Idaho, a large area in eastern Oregon, and parts of Wyoming, Utah, and Nevada.

Columbia River is the largest stream in the western United States. It drains an area of about 295,000 square miles, of which 39,000 square miles is in Canada. Nearly 40 percent of the total area is above the mouth of Snake River. Although Snake River drains 109,000 square miles, its discharge is considerably less than that of Columbia River at their confluence.

The headwaters of Columbia River drain an area of high mountains, heavy forests, numerous glaciers, and extensive snow fields. Tributaries from the east drain a timbered mountainous area west of the Rocky Mountains. East of Columbia River in

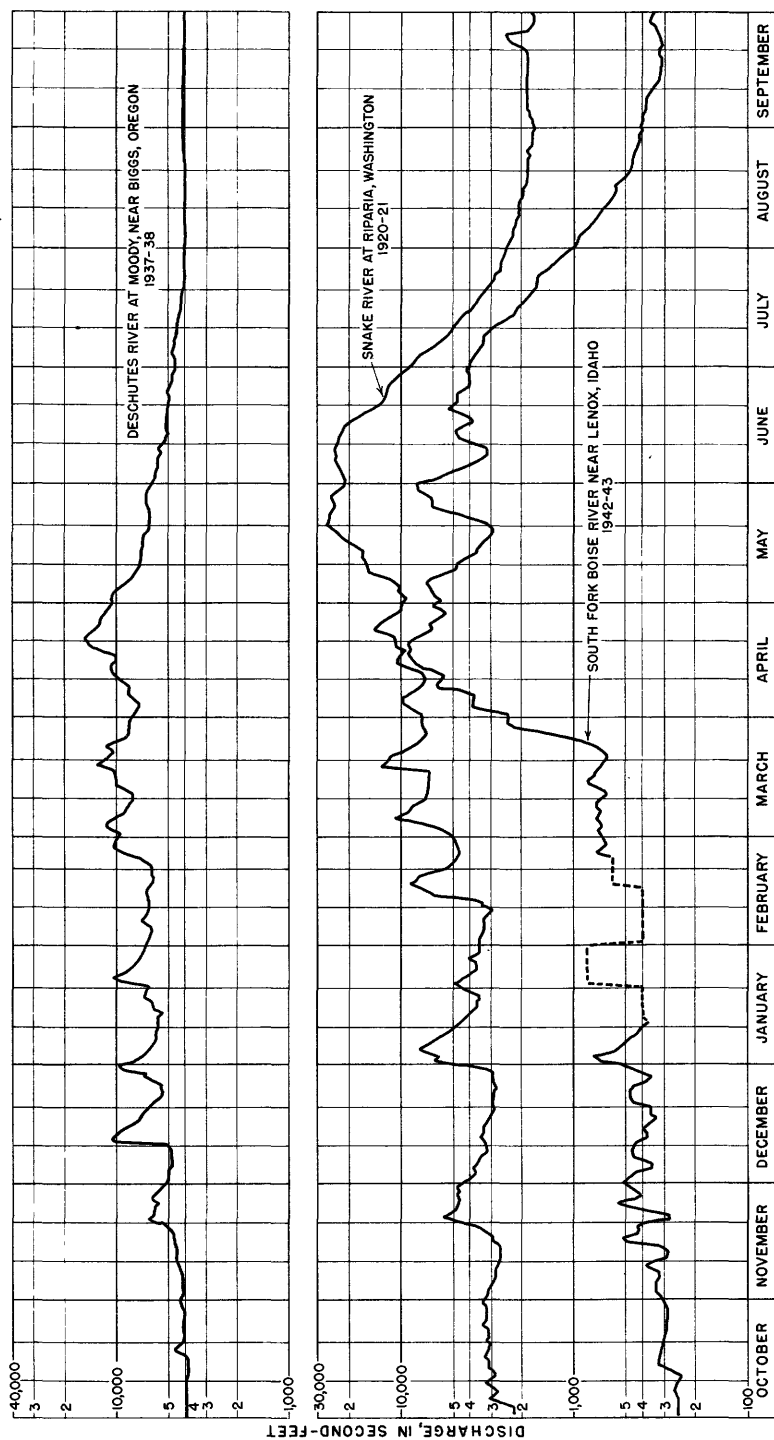


Figure 21.--Graphs of mean daily discharge for year of high runoff at river-measurement stations on Snake, Boise, and Deschutes Rivers.



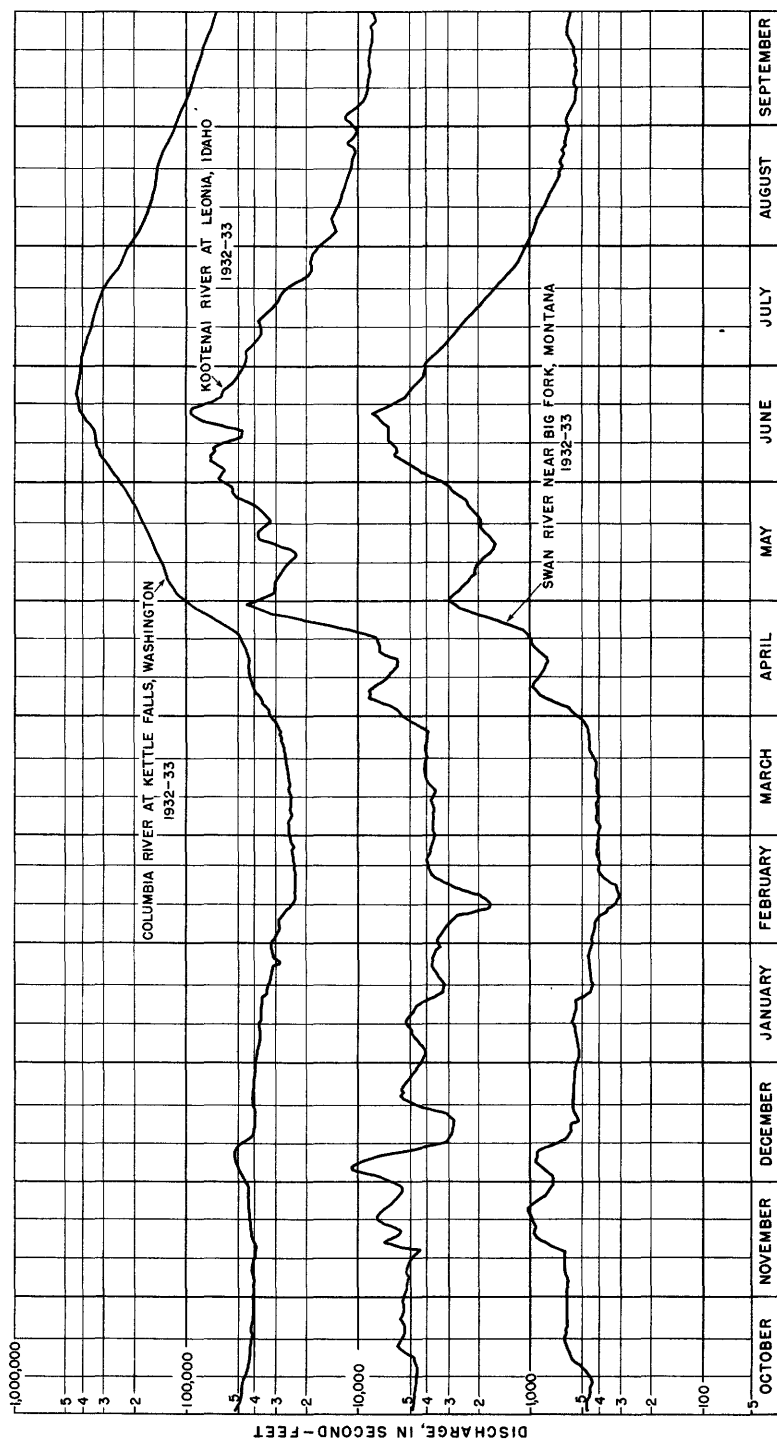


Figure 22.-- Graphs of mean daily discharge for year of high runoff at river-measurement stations on Columbia, Kootenai, and Swan Rivers.

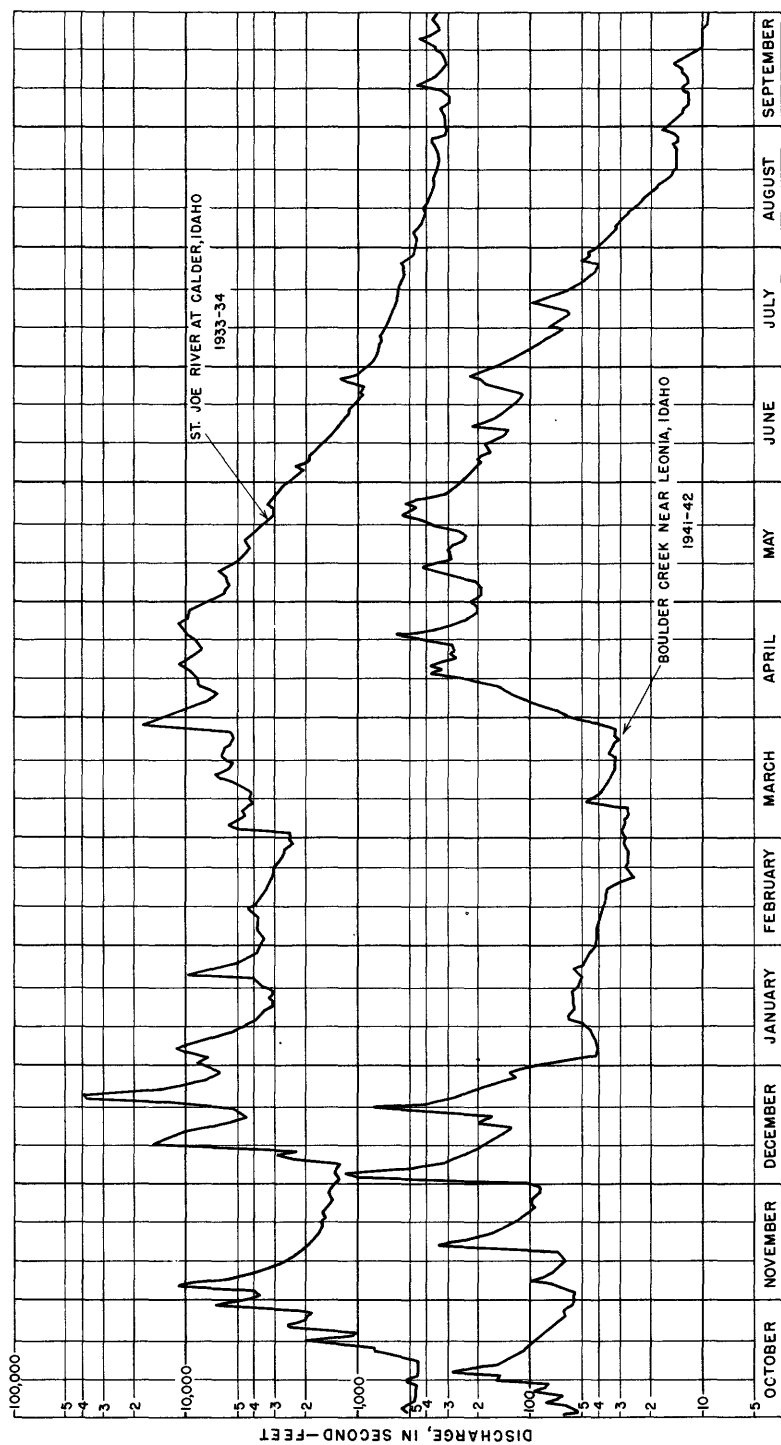


Figure 23.--Graphs of mean daily discharge for year of high runoff at river-measurement stations on St. Joe River and Boulder Creek.

Washington is the great rolling Columbia River Plateau. This plateau, which has few stream channels, is arid and covered with sagebrush, although in the eastern part there is sufficient moisture for dry farming. From this area no tributary of consequence enters Columbia River for the 317 miles between Spokane and Snake Rivers. The annual runoff for this 9,000 square miles is nearly zero. It is in this area that the great Columbia Basin irrigation project is being developed.

Much of the Snake River Basin is arid, especially in southern Idaho, and from the mouth of Snake River to the Cascade Mountains precipitation is quite low. That part of Columbia River Basin west of the Cascade Range is humid and subject to winter floods, which are due to intense rains. It differs radically from the rest of the basin and contributes only a small percentage of the spring flood volumes of Columbia River.

#### CHARACTERISTICS OF FLOODS IN COLUMBIA RIVER BASIN

Storms traveling eastward from the Pacific lose a considerable part of their moisture on the west side of the Cascade Range, with the result that the eastern slopes receive little rain. In the region just east of the Cascade Range the annual precipitation is 4 to 10 inches a year. As the storms move eastward and encounter higher altitudes the precipitation increases until the Continental Divide is reached. A large percentage of this precipitation occurs during the winter and spring, and at the higher altitudes it occurs as snow.

Columbia River and its larger tributaries, particularly in the upper part of the basin, are unusually regular in their annual high-water cycle. The one high-water period each year occurs in summer and is due primarily to snow melt at high altitudes. Except for that part of the basin west of the Cascade Range, floods are rarely due directly to storm rainfall, even on the smaller streams. Floods of record proportions have occurred on some Columbia River tributaries during winter months, but snow melt was a contributing factor.

Except in the Kootenay Flats, normal spring floods cause comparatively little damage because of deep channels and adequate fall. In fact, these spring floods are generally beneficial, as they come at a time when water is needed for irrigation. An unusually large flood, such as that of 1948, causes disastrous losses, because the major part of the commercial development and much agricultural development are along the river channels.

Figures 21-23 show typical hydrographs of daily mean discharge for water years during which high peak flows occurred. All these hydrographs show a spring rise due to snow melt. The rise is more gradual on the larger streams, as their flow is the combination of flows of many small streams, the peaks of which do not coincide. Hydrographs for St. Joe River at Calder, Idaho, and Boulder Creek near Leonia, Idaho (fig. 23), are shown for selected years during which the annual peak flow occurred in winter. These high winter flows resulted from heavy rains and high temperatures which melted snow that was already on the ground. The hydrograph patterns of these two streams are usually similar to the others shown, in that the peak discharge occurs during the spring rise. Snow runoff from the lower Columbia River tributaries occurs earlier in the year than from tributaries in the northern part of the basin. Normally Snake River attains its peak flow before Columbia River below the junction, but in both the floods of 1894 and 1948 the respective peaks were nearly coincident.

Some flood hydrographs illustrating unusually rapid flood rises are shown in figure 24. Except on small streams this form of flood hydrograph is not typical for flood rises in the Columbia River Basin, and yet a considerable number of record peak flows are of the type shown. Melting snow contributes an important part of the flood discharge in nearly all instances.

Records of peak stage in the vicinity of The Dalles, Oreg., have been kept since 1858. Major floods occurred in 1862, 1876, 1894, and 1948. The flood of 1849, of which there is no authentic record, was reported to have been 5 feet higher than that of 1862. The greatest of these five floods was that of 1894.

The following description of it is taken largely from newspaper accounts, as there are few official records. It is reported that the winter of 1893-94 was colder than usual and that record depths of snow accumulated in the mountains. Apparently the precipitation for the year was about 150 percent of normal. Unusually high temperatures during late May and early June greatly accelerated the runoff. By May 30 the tributaries were at extreme flood stage, and many railroads were made impassable by washouts and inundation. Columbia River continued to rise at The Dalles until June 6, when a peak discharge of 1,240,000 second-feet was reached. During the period of the rise thunderstorms of cloudburst proportions added to flood volumes in many smaller streams, causing increased damage. The main line of the Great Northern Railway was blocked west of Helena, Mont., by high water and washouts. Damage along Kootenai River was extreme. Between Newport and Bonners Ferry 2 miles of track were completely destroyed, and the town of Bonners Ferry was under 7 feet of water. Along Wenatchee River numerous washouts made the railroad impassable. The flood waters of Columbia River reached the top of rails at the Great Northern depot in Wenatchee, Wash. The peak discharge at this point was estimated to have been 740,000 second-feet. On Yakima River all bridges between Yakima and Prosser were unapproachable, the Union Gap bridge was broken in two, the flats opposite Yakima City were inundated, and in the bottom lands near Parker water was several feet deep, nearly reaching the tops of the hop poles. The Northern Pacific Railway along Clark Fork, normally 20 feet above water, was 1 to 5 feet under water for 95 miles, from Horse Plains, Mont., to a point a few miles west of Hope, Idaho. Flood damage in Montana was very great and would have been greater had it not been for the fact that the country was rather thinly settled. All wooden railroad and wagon bridges across Spokane River in the vicinity of Spokane were washed out. By far the greatest flood damage occurred on Columbia River below The Dalles. Although the Cascade locks were saved, cost of repairs was estimated to be \$600,000. Two hundred miles of the Union Pacific railroad was inundated, water being over the tops of telegraph poles for miles, and 100 miles of the track was almost completely destroyed. The entire wholesale district of Portland was under 6 to 10 feet of water. Travel east from Portland was by transfer boat to Kelso, Wash., railroad to Tacoma, Northern Pacific Railway to Spokane, and thence by branch line to Umatilla, Oreg., on the main line of the Union Pacific Railroad. An enormous area in the lower Columbia River Valley was inundated. Passengers on one trip by transfer boat from Portland to Kelso counted 100 houses floating in the river. Floods on Fraser River in British Columbia and on the streams west of the Cascade Range in Washington added to transportation difficulties. The flood subsided slowly on the larger streams and

especially on Columbia River. Snow was reported to be 10 to 30 feet deep on the headwaters of Okanogan, Yakima, and Cowlitz Rivers and other streams as late as June 6, the date of the flood crest at The Dalles. Estimates of the flood damage varied greatly. An article in the Tacoma Daily Ledger for June 10, 1894, states that the damage in the Northwest was conservatively estimated to be \$5,200,000, of which \$2,800,000 was to railroads and \$1,000,000 was attributed to farms damaged and crops lost in British Columbia, Oregon, Washington, Idaho, and Montana. It was noted that the greater part of the damage occurred below the mouth of Snake River.

In the 53-year period between 1894 and 1948 the nine highest flood peaks on Columbia River in the vicinity of The Dalles ranged in magnitude from 722,000 second-feet to 787,000 second-feet. The highest of these is less than 70 percent of the 1894 peak. During recent years long-range estimates of peak flow, determined from snow surveys, and accurate forecasting of flood stages several days in advance have been valuable in reducing flood losses on the larger streams.

An example of a comparatively localized flood is that of December 1921 on Wenatchee River. November was a mild month except for a sudden cold spell from November 17 to 24. During this period about 46 inches of snow fell on the eastern slope of the Cascades. Much of this snow was melted by a rain that began at the lower altitudes on November 22. By the end of the month only 20 inches of snow remained. This remaining snow was taken off by excessive rains and warm winds between December 10 and 14, particularly those of December 11 and 12. The resulting flood caused considerable losses and, until 1948, was the largest of record. (See fig. 24.)

The most general winter flood of record in Columbia River Basin occurred in December 1933. This flood was unusual on account of its severity, the great length of time it prevailed, and the large area affected. In the Yakima and Spokane River Basins record flood peaks were established. Although Columbia River did not reach flood stage, the damage along tributary streams was enormous. Damage in the State of Washington was estimated to be \$10,400,000.

The flood in the Yakima River Basin is described, as the pattern of precipitation was somewhat typical of that which occurred throughout much of the upper Columbia River Basin. Yakima and Naches Rivers began to rise noticeably on December 9, 1933, reaching on December 12 the highest crest since 1917. The flood waters receded gradually from December 13 to 17, rose slightly from December 18 to 22, and then on December 23 rose to a peak discharge that was approximately three times greater than the one recorded on December 12.

The floods resulted from a heavy snow cover on the upper drainage area, unseasonably warm weather with melting of snow, and copious rainfall. An unusually high temperature accumulation took place after October 1 and through December. Precipitation for December averaged 367 percent of normal at the various reservoirs on the headwaters of Yakima River. The peak discharge of Yakima River at Union Gap was 54,300 second-feet, and had it not been for reservoir storage the peak probably would have been above 80,000 second-feet.

Intense precipitation over small areas in Columbia River Basin occasionally causes considerable damage. On May 27, 1894, a storm of cloudburst proportions occurred on the headwaters of Salmon Creek, a tributary of Okanogan River. Newspapers reported that the resulting flood crest, which was 8 to 12 feet high when it passed through the town of Conconully, Wash., destroyed or washed away every one of the 125 buildings except the

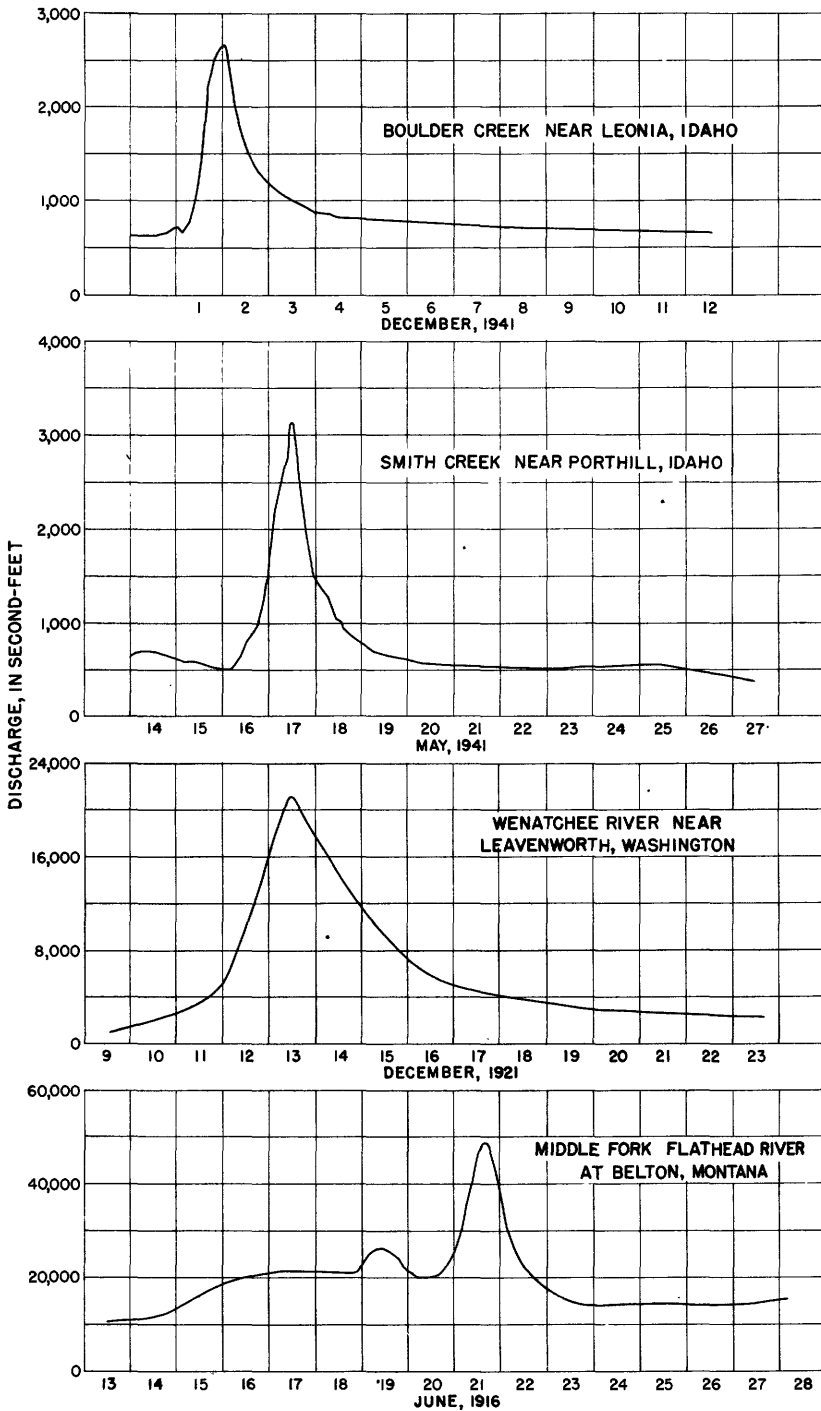


Figure 24.--Graphs of discharge of various floods at different river-measurement stations in Columbia River Basin.

post office and a hotel. Only one life was lost, because the inhabitants had warning. The water receded within an hour or two.

Considerable data are available on the Squillechuck Creek flood of 1925. This creek is tributary to Columbia River at Wenatchee, Wash. It has a total drainage area of 27.2 square miles and a fall of 6,200 feet in 11 miles. On September 5 a very localized storm centered over a part of this basin and caused such a rapidly advancing flood that 14 people were drowned, and property near the mouth of the creek was damaged to the extent of \$130,000. Computations made from field information indicate that the intensity of runoff was 620 second-feet per square mile from 26.6 square miles.

#### METHODS OF ANALYSIS

In this report the flood data are analyzed by the annual-flood method and by the partial-duration-series method (Poster, 1924, pp. 142-203). In the former method only the highest peak discharge in each water year is used. In the latter method all peak discharges above an arbitrarily chosen base are used, without regard to the number of peaks within a water year. Consequently only the annual series is a complete probability or frequency series and thus is readily susceptible of mathematical analysis by fitting frequency curves to the plotted points. On the other hand, the partial-duration series may often list major floods excluded from the annual series, and though not representing a complete time series it gives results in a form that may be more nearly what is desired than those obtained by the annual-flood method. For those stations having few years with more than one peak, the two methods give essentially the same results.

Statistical analysis of the probability of recurrence of floods of various magnitudes has been the subject of numerous investigations. Some of the best known are those of Hazen (1930), Foster (1924, pp. 142-203), Goodrich (1927, pp. 1-91), Slade (1936, pp. 35-104), and Gumbel (1943, pp. 699-716; 1945, p. 83). Each investigator has favored some particular method of analysis. The Gumbel theory, based on the consideration that the annual flood is the maximum of a large number of independent events, arrives at a frequency distribution of floods with coefficient of skew implied as a constant, 1.139. Gumbel introduces two parameters,  $u$  and  $1/a$ , representing, respectively, the modal (most common) flood discharge and the logarithmic rate of increase. These two parameters are computed from the mean flood and the standard deviation of the series. Furthermore, by introducing a dimensionless variable  $y$  (reduced flood), related to the return period  $T$ , Gumbel arrives at an equation for his theoretical magnitude-frequency curve:  $x = u + (1/a) y$ , where  $x$  is the flood equaled or exceeded on the average once in  $T$  years.

The Gumbel procedure has much to recommend it. The linear form of his equation of the magnitude-frequency curve simplifies plotting, and he has fixed the rather uncertain coefficient of skew by the development of a rational theory. A possible weakness of the theory lies in the fact that it is based on two premises that have yet to be conclusively demonstrated: (1) that a year includes a large number of independent flood events and (2) that the duration curve of daily discharge approaches an exponential function of the form  $e^{-x}$  at its upper extremity.

Gumbel also derives by mathematical means a plotting position which assumes that each flood in the sample available corresponds to the modal or most probable value of floods of the same relative magnitude in a large number of series. He presents formulas

and tables for the plotting positions of the highest and lowest values of an array, as well as a formula and table for interpolating the remaining plotting positions between these two extremes.

#### Plotting positions

In each of the two arrays, the annual series and the partial-duration series, the tabulated floods were numbered in order of their magnitude, beginning with the highest. The recurrence interval of each flood was then computed by the formula  $T = \frac{N+1}{M}$  for determining plotting position, in which  $T$  is the recurrence interval in years,  $M$  is the relative magnitude of the flood, and  $N$  is the total number of years. This formula is based on the premise that for any number of items ( $N$ ) in an annual series there are  $N + 1$  intervals into which any subsequent flood will fall. That is to say, a subsequent flood may either exceed the highest in any array, fall short of the lowest, or fall into one of the  $N-1$  intervals between the two. This formula gives results acceptably in conformance with those obtained by the Gumbel formulas. It is simple to compute, and it is equally applicable to the annual series and partial-duration series.

Where the maximum flood is one that antedates the period of record, its recurrence interval is computed entirely independently of those floods within the period of record. Its recurrence interval is assumed to be equal to one plus the number of years for which it is known to be the highest flood.

The Hazen method of computing plotting positions has been widely used in the past. In this method, the recurrence interval,  $T$  is computed as  $\frac{N}{M - \frac{1}{2}}$  where  $N$  is the number of years of record, and  $M$  is the rank of the flood beginning with the largest. This method assumes that a flood of any relative magnitude in a series will occupy a medial position among floods of the same relative rank in a large number of series, in contrast to the modal position advocated by Gumbel.

The equation  $T = \frac{N}{M}$  has also been used in flood-frequency studies. This method assumes that the flood events in the period of record have the same frequency distribution as those of a longer period; that is, the highest flood in 10 years of record has a recurrence interval of 10 years.

The following table illustrates the recurrence interval obtained from various plotting formulas and by the binomial theorem expansion for a 10-year record:

Recurrence interval (years)

Magnitude of annual flood	Hazen, $\frac{N}{M - \frac{1}{2}}$	$\frac{N}{M}$	Gumbel	$\frac{N+1}{M}$	Binomial theorem expansion	
					Medial	Modal
a/ 1	20.0	10.0	10.5	11.0	14.9	10.5
2	6.67	5.00	5.31	5.50	6.25	4.87
3	4.00	3.33	3.55	3.67	3.84	3.26
5	2.22	2.00	2.14	2.20	2.24	2.00
7	1.54	1.43	1.53	1.57	1.56	1.45
10	1.05	1.00	1.07	1.10	1.07	1.05

a/ Highest; numbered in order of magnitude.

From this table it can be seen that the Hazen recurrence interval of 20 years is nearly double the recurrence interval derived by other methods, except for the medial flood in the binomial theorem expansion. The Geological Survey has in the past (Jarvis and others, 1936) used the Hazen method for computing the recurrence interval.



However, later developments, including the Gumbel theory, have resulted in a preference for a method that assumes a modal position for the largest flood. In this report, the equation  $T = \frac{N+1}{M}$  has been used exclusively.

For discussions of other plotting procedures the reader is referred to the various articles cited in the list of references.

#### Annual-flood method

Having determined the recurrence intervals for the annual-flood series as described above, the next step was to plot the flood magnitude-frequency relation. For this purpose a special plotting paper was prepared in accordance with the Gumbel theory as suggested by Powell (Feb. 1943, pp. 35-104). The horizontal lines are spaced uniformly for the discharge scale, and the distance between the vertical lines is made proportional to  $y$  (reduced flood) for the recurrence interval scale. The intercept on the  $y = 0$  ordinate (the dashed line at  $T = 1.58$  years) is  $u$ , the computed modal flood, and  $1/a$  is the slope of the line. The mean discharge plots at  $y = +0.577$  or  $T = 2.33$  years, shown as a dotted line.

With the data plotted, the question of fitting a curve naturally arises. A line could be fitted using the Gumbel equations or the methods of least squares. The short lengths of the records and the sampling errors inherent in the data indicate that analytically fitted functions are not worth while and may be misleading. The plotted points were, therefore, merely joined by straight lines and any curve fitting is left to the judgment of the user. As the plots on Gumbel paper should approximate a straight line, fitting such a line by eye probably gives results as reliable as those obtained by more involved methods. The Gumbel theory has not yet been proved conclusively. The use of a curve as the line of best fit cannot be considered erroneous.

The annual-flood frequency graph for Columbia River near The Dalles, Oreg., for the period 1858-1946 (fig. 26), illustrates the applicability of the Gumbel diagram. The computed Gumbel line is shown.

#### Partial-duration-series method

The objection to the omission of major floods in the annual series is met in the partial-duration series by listing all floods above a selected base, without regard to the number within any given time period. When the maximum daily flood flows, rather than instantaneous peaks, are listed, such a series is essentially the upper end of the flow duration curve for the gaging station, hence the name partial duration. However, instantaneous peak discharges are used in this report with few exceptions.

With all the floods above the selected base tabulated and the recurrence intervals computed, as described on preceding pages, the data were plotted on semilog paper. Discharges are plotted arithmetically and recurrence intervals logarithmically. The plotted points were joined by straight lines; no curve or line of best fit was attempted. As the data of a partial-duration series do not form a complete frequency series, statistical analysis is difficult. Should the user of the data desire to fit a curve to the plotted points, he can do so by inspection.

Geyer (1940, pp. 660-668) has proposed a graphical method of determining the equation of the curve of best fit, but it has been found, in this study at least, to be of very limited applicability. One of the objectionable features is that his

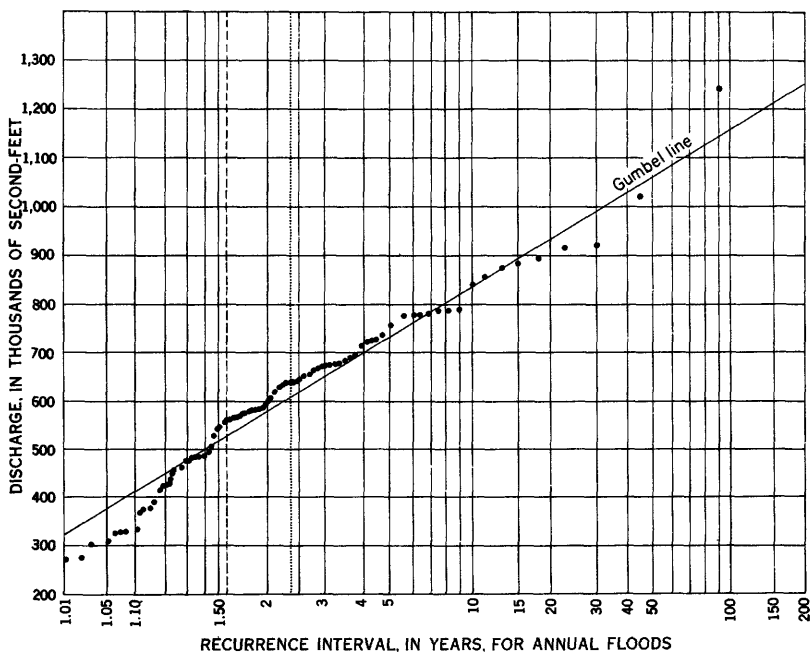


Figure 25.--Annual-flood frequency graph for Columbia River near The Dalles, Oreg., showing use of Gumbel diagram.

equation employs as one of its constants the upper limiting flood of the drainage basin. This limiting value is of course very indefinite.

Comparison of annual-flood and  
partial-duration-series methods

The special applicability of the frequency graphs of the annual flood series on the one hand and the partial-duration series on the other is apparent if distinction in meaning of the term "recurrence interval" as applied to each method is kept in mind. In the annual-flood series the recurrence interval is the average interval in which a flood of given size will be equaled or exceeded as an annual maximum. In the partial-duration series it is the average interval in which a given flood will be equaled or exceeded, regardless of relationship to the year or any other period of time. This distinction remains, even though for very large floods the numerical values of the two are sensibly the same.

The annual-flood series might, for example, be used in the design of a bridge, which once destroyed might take as long as a year to replace. In this case the flood to be considered is the highest flood in a year. Other floods, though they may exceed ranking floods in other years, will cause no further damage to the structure. However, if one considers a highway that will be inundated but not necessarily destroyed by any flood, or if damaged will be repaired rapidly and again be exposed to risk, it is apparent that the partial-duration series should be employed.

The greater number of floods listed in the partial-duration series is commonly considered an advantage, particularly when the record is short. However, most of these points are at the low end of the graph, and the points at the upper end are

generally identical with those in the annual-flood series. An objection to the use of the partial-duration series is the fact that the floods listed may not be fully independent events; that is, one flood sets the stage for another. A related objection is the fact that when the listed peaks follow each other closely any damage will probably be caused by the highest, the associated peaks having only indirect or secondary effects on the losses.

For intervals of less than 10 years, a flood of given size will have a shorter recurrence interval in the partial-duration series than it will in the annual series. The two methods give essentially identical results for the larger floods for intervals greater than about 10 years. As most designs are for intervals greater than this, it is apparent that from a practical standpoint either method is satisfactory, although perhaps the simplicity of the annual-flood method makes it attractive.

#### Probable error of a flood-frequency graph

The plotting positions used in this report are based on the assumption that the flood series listed would occupy a modal position in a large number of flood series of the same length. However, the single series available may represent a period of high flood activity or low flood activity. There is little knowledge of its normality in this respect. By use of the binomial theorem of probability the probable limits of variation can be determined. It is conventional to let the quartile points (25 percent and 75 percent probabilities) mark these limits. The recurrence intervals for a 25-year series for probabilities of 25 percent and 75 percent and the recurrence intervals computed by the formula  $T = \frac{N+1}{M}$  would be as follows:

Magnitude	Recurrence interval (years)		$\frac{N+1}{M}$
	Probability = 0.25	Probability = 0.75	
1	18.5	90.8	28.0
2	9.9	25.6	13.0
3	6.8	14.5	8.7
4	5.2	9.8	6.5
5	4.2	7.4	5.2
6	3.6	5.8	4.3
7	3.1	4.9	3.7
8	2.7	4.1	3.2
9	2.4	3.6	2.9
10	2.23	3.17	2.60
15	1.58	1.97	1.73
20	1.23	1.40	1.30
25	1.01	1.06	1.04

These limits of variation are shown on the flood-frequency graph for Swan River near Big Fork, Mont., for the period 1922-46, a 25-year record. (See fig. 26.) The quartile graphs shown were drawn after smoothing the irregularities of the modal graph. According to the theory here expressed, there is a 50-percent chance that future experience will show that the probable error will be between the limits shown. Of course there is also a 50-percent chance that it will be outside the limits shown, but the 50-percent brackets are customary for expressing "probable" limits of variation.

Considering the wide range of probable error indicated, the results obtained from elaborate mathematical processes for analyzing flood frequency data are highly questionable. Extrapolation, whether graphical or analytical, has a firm basis only when the phenomena have been demonstrated to conform to underlying law. This law of flood occurrences has not yet been discovered.

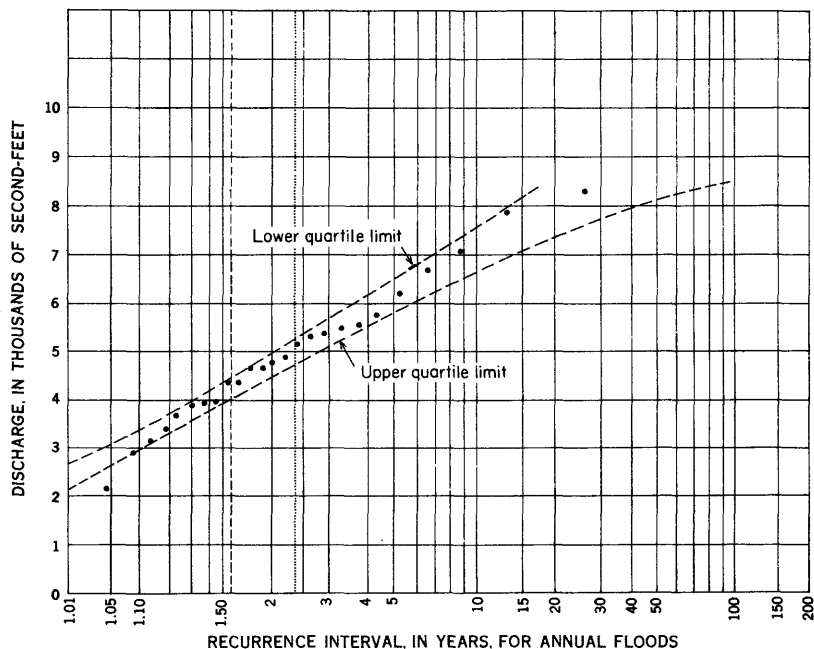


Figure 26.--Flood-frequency graph for Swan River near Big Fork, Mont., showing probable limits of variation.

#### THE ENVELOPING CURVE

The enveloping curve of maximum discharges per square mile for stations in the Columbia River Basin (fig. 27) is based mainly on data given in the summary of flood discharges in this flood report. It should not be construed as a maximum expected flood discharge curve. For drainage areas smaller than 4,000 square miles the enveloping curve is based on stream-flow records that are generally less than 30 years in length. The comparatively few records of long duration indicate that the last two decades have been considerably drier than preceding years, and consequently the plotted discharges in general represent a period of relatively low flow. It is probable that the flood activity during this period was below normal. For areas larger than 4,000 square miles the curve is based mainly on the flood of 1894, which is known to have been the greatest general flood in the basin in nearly 100 years. Only 9 determinations of discharge for that flood have been made.

Available records produce no evidence that large-scale major floods in the Columbia River Basin above the Cascade Range have been caused by rains not associated with melting snow. Much of the basin is semiarid, and although summer cloudburst storms cause occasional flash floods, these storms are confined to small areas. A discharge of 620 second-feet per square mile was attained on Squillchuck Creek at Wenatchee, Wash., in September 1925 from a drainage area of 26.6 square miles. Few computations of peak flow have been made on floods of this type, but a considerable number of these floods have been reported.

The enveloping curve of peak discharges from areas larger than 50,000 square miles gives rates of flow equal to or greater than those that have occurred in other western river systems. For areas under 10,000 square miles, but excluding the extremely small areas, the curve shows the lowest flood discharge per square mile of any basin west of

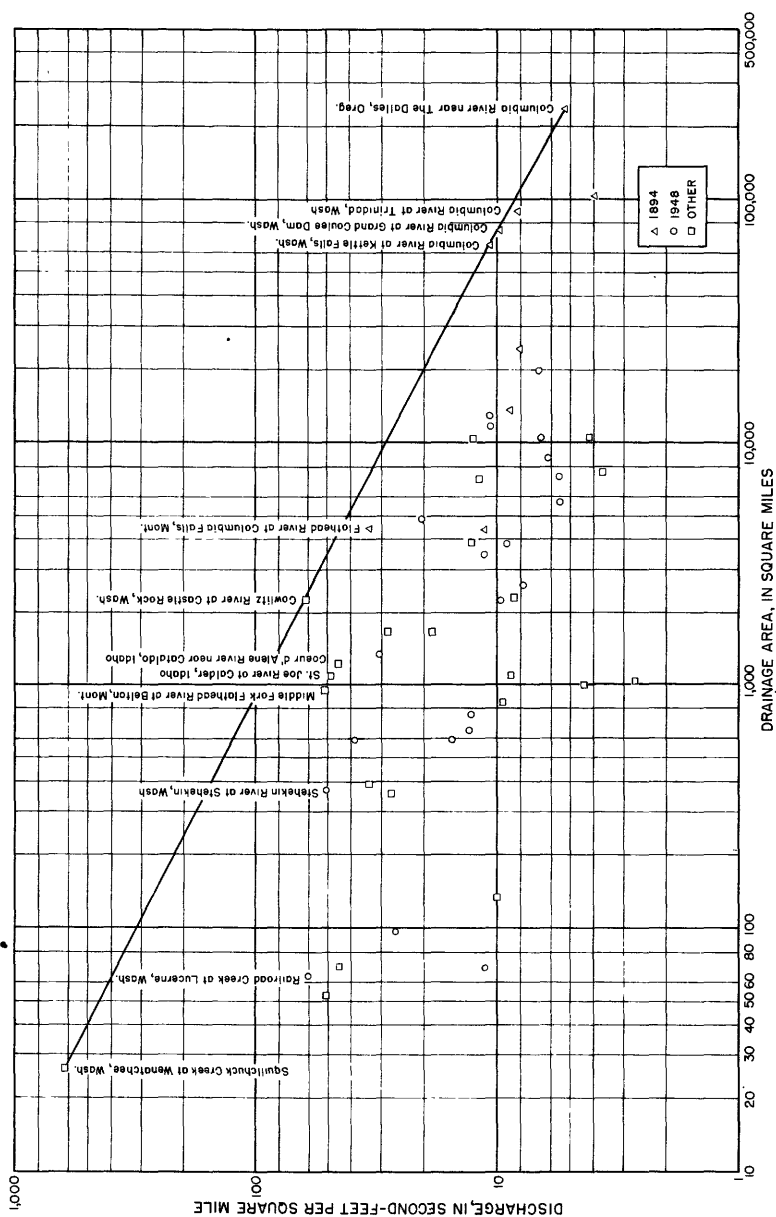


Figure 27.--Maximum discharges, in second-foot per square mile, of various floods for different areas in Columbia River Basin.

Mississippi River, with the exception of Great Basin. The maximum rate at which snow melts under natural conditions is not sufficiently rapid to produce discharges from small basins even approaching those that result from intense rains. However, snow melt over large areas, contributing simultaneously through many tributaries to the major stream, results in flood flows comparable with those from heavy rains.

The curves for the sub-basins reflect varied characteristics. A line enveloping discharges for streams in the Spokane River Basin would have a steep slope, owing to two conditions. Storage in Coeur d'Alene Lake flattens the flood peaks on Spokane River considerably. As for Spokane River itself, its bed and banks are composed of a glacial outwash of gravel, with the bed having a silt overburden. As the stage rises above this overburden, water rapidly percolates into the exposed gravel banks and goes into bank storage to be released at a lower river stage.

The enveloping curve for the Okanogan River Basin would also have a very steep slope. Similkameen River is the principal tributary of Okanogan River and flows into it a short distance upstream from the gaging station near Tonasket. At the junction the two stream basins are roughly equal in drainage area. Lighter precipitation and the considerable lake storage in the upper Okanogan Basin combine to reduce its peak discharges to about 10 percent of those on Similkameen River. The time lag between peaks on these two streams further tends to bring about peaks of nearly equal magnitude on Similkameen River and Okanogan River below the junction.

If sufficient records of virgin flow on other tributary basins were available the effects of other basin characteristics might be shown. The enveloping curve is principally of value in presenting an over-all view of known flood occurrences. It has limited use as a means of determining the flood-producing potentiality of a stream with a relatively short runoff record by comparison with a neighboring stream having a longer record. Only where a reasonable relation can be found between each of the various characteristics of the two basins will this method give plausible results.

#### FLOOD MAGNITUDE AND FREQUENCIES

The information on time, gage height, and discharge of floods in the following flood frequency studies is taken, with few exceptions, from the original stream-gaging records of the Geological Survey. Most of the gaging-station records studied are of more than 20 years duration. As a matter of general interest annual peak discharges for two Spokane River stations are included, although the large degree of regulation on that river for power operations precludes any analysis of flood frequency.

For the purpose of this compilation a flood peak is defined as a discharge which significantly exceeds the preceding and following discharges. It is usually at least 25 percent greater than the adjacent troughs in the discharge graphs, and in general is associated with a separate and distinct meteorological event. The base flow or lower limiting value in selecting flood peaks at each station is in general taken as the minimum annual peak, so as to include at least one flood in each year of record. Most of the floods in the upper Columbia River Basin result from snow melt, and consequently there is often a lack of complete independence between peaks.

Flood data may be collected on the basis of either maximum daily mean discharge or instantaneous peak discharge for each flood rise. The former has been extensively used in previous studies because of the availability of the daily mean discharges.

Instantaneous peak values determined from recorder charts or from graphs based on nonrecording gage readings are used in this report, except at a few gaging stations where the instantaneous peaks and daily mean discharges have sensibly the same value. Where daily figures have been used, this fact is noted in the individual station description.

In the tabulations of peaks at each gaging station, all complete years are used. Incomplete years are used for the annual-flood series if it is known that the maximum flood of the year occurred during the period of record. For the partial-duration series, incomplete years are used only when there is good evidence that no floods above the base occurred during the missing period. For several stations where the discharge is known for a flood prior to the period of record, as the 1894 flood, it is included in the tabulation if it is known to have been the maximum for the time between its occurrence and the start of the period of record.

Records for each gaging station have been reviewed critically for accuracy and consistency in the light of present standards and practices. In some instances figures of discharge have been used that differ from those previously published in water-supply papers. These differences may be due to revision of the rating curve on the basis of later and more accurate information or to the use of graphs constructed from nonrecording gage readings in place of the readings themselves as used originally. Where the differences are appreciable the previously published figures are considered as being revised, and as such will be reported in the annual reports on Surface Water Supply of the United States. Where no such revisions are reported, it can be assumed that the figures originally published can be used without significant loss of accuracy.

The data are listed by water years ending September 30.

## COLUMBIA RIVER MAIN STEM

Columbia River at Kettle Falls, Wash.

Location.- Lat. 48°37'20", long. 118°07'00", at Kettle Falls, 3½ miles upstream from Colville River, May 3, 1931 to June 9, 1941. At site 1½ miles downstream from Kettle Falls, June 5, 1921 to May 2, 1931. Prior to June 5, 1921, and during part of winter 1922-23, U. S. Weather Bureau gage at Marcus, 4½ miles upstream from Kettle Falls.

Drainage area.- 64,500 square miles.

Records available.- April 1913 to June 1941, including estimated monthly discharge for period prior to April 1916 and for winter months prior to winter of 1921-22.

Gage.- Non-recording gage read once daily to Apr. 19, 1921; twice daily thereafter to May 2, 1931. Recording gage May 3, 1931, to June 9, 1941. After June 5, 1921, datum of gage at mean sea level, subject to correction to datum of 1929. Datum of U. S. Weather Bureau gage is 1,205.55 feet above mean sea level, subject to correction to datum of 1929.

Stage-discharge relation.- Defined by current-meter measurements below 431,000 second-feet.

Maximum flood of record.- 468,000 second-feet June 14, 1913.

Historical data.- Flood of June 1894 reached a stage of 44.7 feet on U. S. Weather Bureau gage at Marcus (discharge, 700,000 second-feet, based on information from several sources).

Remarks.- Discharges listed are daily means. Flow affected by natural storage in many lakes. Many diversions above station for irrigation, but quantity diverted is very small percentage of total flow. Gage heights prior to June 5, 1921, obtained from stage-relation curve between Kettle Falls and Marcus.

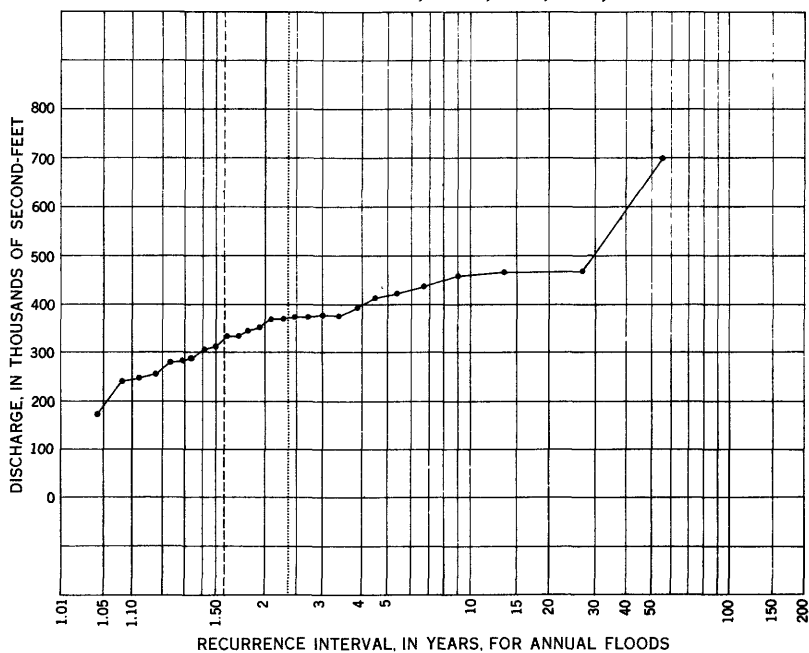
Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1894	June		a44.7	700,000	1	56.0		
1913	June	14	a34.2	468,000	1	27.0		
1916	June	30	1,233.8	458,000	3	9.00		
1917	June	24	1,230.0	367,000	13	2.08		
1918	June	26	1,231.2	396,000	7	3.86		
1919	June	1	1,227.5	309,000	19	1.42		
1920	July	17	1,228.5	332,000	17	1.59		
1921	June	11	1,192.7	420,000	5	5.40		
1922	June	17	1,190.7	373,000	9	3.00		
1923	June	17	1,190.6	371,000	11	2.45		
1924	May	25	1,186.9	287,000	20	1.35		
1925	May	27	1,190.7	373,000	10	2.70		
1926	May	7	1,180.0	168,000	26	1.04		
1927	June	18	1,192.4	413,000	6	4.50		
1928	May	30	1,194.6	466,000	2	13.5		
1929	June	16	1,188.1	313,000	18	1.50		
1930	June	15	1,184.8	246,000	24	1.12		
1931	June	13	1,188.0	240,000	25	1.08		
1932	June	18	1,194.4	351,000	14	1.93		
1933	June	22	1,196.1	435,000	4	6.75		
1934	June	2	1,194.9	369,000	12	2.25		
1935	June	19	1,193.3	355,000	16	1.69		
1936	June	4	1,195.0	374,000	8	3.38		
1937	June	24	1,189.2	256,000	23	1.17		
1938	June	8	1,193.6	344,000	15	1.80		
1939	June	1	1,190.4	279,000	21	1.29		
1940	June	2	1,190.4	277,000	22	1.23		
Period 1913, 1916-40				346,900	Mean annual			

a U. S. Weather Bureau gage at Marcus.

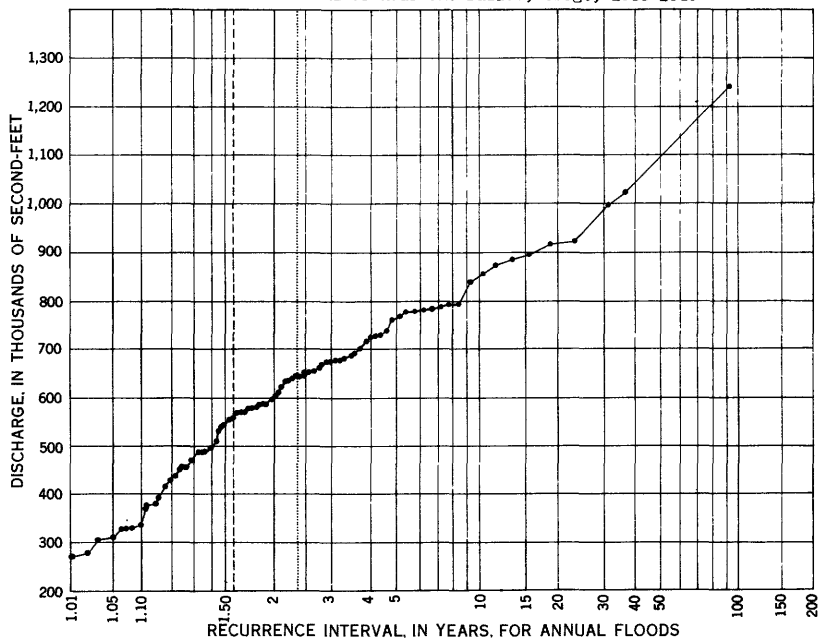


## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

Columbia River at Kettle Falls, Wash., 1894, 1913, 1916-40



Columbia River near The Dalles, Oreg., 1858-1948



## COLUMBIA RIVER MAIN STEM

Columbia River near The Dalles, Oreg.

(Formerly published as Columbia River at The Dalles)

Location.- Lat. 45°39', long. 120°58', just upstream from Celilo Falls, 3 miles downstream from Deschutes River, and 11 miles east of The Dalles. Prior to Oct. 1, 1931, at following sites: June 1 to Dec. 11, 1878, at Umatilla, 100 miles upstream from The Dalles; Dec. 12, 1878, to Oct. 9, 1879, just upstream from Cascade Locks, 42 miles downstream from The Dalles; Oct. 10, 1879, to June 30, 1881, at The Dalles; July 1, 1881, to Jan. 31, 1892, just upstream from Cascade Locks; Feb. 1, 1892, to Sept. 30, 1931 at The Dalles. Umatilla, John Day, and Deschutes Rivers enter between Umatilla and Celilo Falls; Hood, Klickitat, and White Salmon Rivers enter between The Dalles and Cascade Locks.

Drainage area.- 237,000 square miles (above The Dalles).

Records available.- June 1878 to September 1948. Annual floods 1858-77.

Gage.- Non-recording gage read once daily prior to Oct. 1, 1931, twice daily Oct. 1, 1931, to May 1, 1935; recording gage thereafter. Gage datum elevations are as follows: June 1, 1878, to Dec. 11, 1878, not known; Dec. 12, 1878, to Oct. 9, 1879, July 1, 1881, to Jan. 31, 1892, 52.56 feet below mean sea level (readings reduced 96.0 feet before publication); Oct. 10, 1879, to June 30, 1881, Feb. 1, 1892, to Sept. 30, 1931, 48.86 feet above mean sea level; Oct. 1, 1931, to May 1, 1935, 37.59 feet above mean sea level; May 2, 1935, to Sept. 30, 1946, at mean sea level. All elevations refer to datum of 1929.

Stage-discharge relation.- Defined by current-meter measurements below 1,000,000 second-feet.

Maximum flood of record.- 1,240,000 second-feet (revised) June 6, 1894.

Historical data.- Gage-height records were obtained for annual floods 1858-77 by Oregon Steam Navigation Co. at Lower Cascade Landing. Discharges have been applied to represent flow at The Dalles. Flood of 1862 reached a stage of 48.9 feet and flood of 1876 a stage of 52.3 feet (corrected) at The Dalles. Flood of 1849, of which there is no authentic record, reported to be 5 feet higher than that of 1862.

Remarks.- Discharges listed are daily means. Storage and diversion for irrigation are only a small part of the total flow. Some regulation since 1940 by Franklin D. Roosevelt Lake above Grand Coulee Dam; usable capacity 5,120,000 acre-feet.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1858	-	-	-	563,000	59	1.56		
1859	-	-	-	874,000	8	11.5		
1860	-	-	-	668,000	33	2.79		
1861	-	-	-	618,000	44	2.09		
1862	-	-	48.9	919,000	4	23.0		
1863	-	-	-	777,000	15	6.13		
1864	-	-	-	654,000	35	2.63		
1865	-	-	-	714,000	24	3.83		
1866	-	-	-	839,000	10	9.20		
1867	-	-	-	671,000	32	2.88		
1868	-	-	-	483,000	69	1.33		
1869	-	-	-	328,000	85	1.08		
1870	-	-	-	777,000	16	5.75		
1871	-	-	-	856,000	9	10.2		
1872	-	-	-	737,000	20	4.60		
1873	-	-	-	638,000	41	2.24		
1874	-	-	-	582,000	49	1.88		
1875	-	-	-	684,000	27	3.41		
1876	-	-	52.3	1,020,000	2	46.0		
1877	-	-	-	486,000	67	1.37		
1878	June	12	18.0	485,000	68	1.35		
1879	June	18	31.2	643,000	39	2.36		
1880	July	1	48.5	914,000	5	18.4		
1881	June	17	34.6	598,000	47	1.96		
1882	June	13	40.8	883,000	7	13.2		
1883	June	14	28.3	573,000	54	1.70		
1884	June	13	31.4	698,000	25	3.68		
1885	June	23	22.5	482,000	70	1.32		
1886	June	9	30.4	673,000	31	2.97		
1887	June	19	39.3	896,000	6	15.3		
1888	June	16	25.9	564,000	58	1.58		
1889	June	5	14.7	302,000	89	1.03		
1890	May	14	28.8	633,000	42	2.19		
1891	June	2	21.1	448,000	75	1.23		
1892	June	22	35.0	607,000	45	2.04		
1893	June	14	38.3	679,000	28	3.28		
1894	June	6	59.6	1,240,000	1	92.0		
1895	May	31	28.7	475,000	72	1.28		
1896	June	22	42.9	785,000	13	7.08		
1897	May	24	42.7	780,000	14	6.58		
1898	June	20	36.9	649,000	37	2.49		
1899	June	22	43.0	787,000	11	8.36		
1900	May	19	32.2	547,000	61	1.51		
1901	June	1	37.5	662,000	34	2.71		
1902	June	1	33.7	644,000	38	2.42		

## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

COLUMBIA RIVER MAIN STEM  
Columbia River near The Dalles, Oreg.---Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1903	June	18	43.0	787,000	12	7.67		
1904	May	26	36.0	629,000	43	2.14		
1905	June	15	25.5	412,000	79	1.17		
1906	June	1	23.4	374,000	82	1.12		
1907	June	5	34.1	587,000	48	1.92		
1908	June	18	37.1	653,000	36	2.56		
1909	June	19	38.1	675,000	30	3.07		
1910	May	14	33.1	566,000	56	1.64		
1911	June	17	33.5	574,000	53	1.74		
1912	June	1	33.2	568,000	55	1.67		
1913	June	12	41.8	759,000	19	4.84		
1914	May	27	29.6	493,000	66	1.39		
1915	June	1	20.8	328,000	86	1.07		
1916	July	1	40.4	727,000	21	4.38		
1917	June	20	40.4	727,000	22	4.18		
1918	June	25	33.7	578,000	52	1.77		
1919	June	1	32.5	553,000	60	1.53		
1920	June	26	26.3	428,000	77	1.19		
1921	June	11	42.4	773,000	17	5.41		
1922	June	9	38.2	677,000	29	3.17		
1923	June	14	33.8	581,000	50	1.84		
1924	May	26	26.6	433,000	76	1.21		
1925	May	24	36.6	642,000	40	2.30		
1926	May	8	17.1	269,000	91	1.01		
1927	June	18	38.8	690,000	26	3.54		
1928	May	29	42.1	766,000	18	5.11		
1929	June	19	27.7	460,000	73	1.26		
1930	June	14	20.2	332,000	84	1.10		
1931	May	19	18.8	308,000	88	1.05		
1932	May	24	106.0	565,000	57	1.61		
1933	June	18	110.0	722,000	23	4.00		
1934	May	2	103.1	453,000	74	1.24		
1935	June	10	141.31	476,000	71	1.30		
1936	May	17	142.7	529,000	64	1.44		
1937	June	24	138.62	376,000	81	1.14		
1938	May	31	144.6	605,000	46	2.00		
1939	May	21	138.9	387,000	80	1.15		
1940	June	5	138.42	369,000	83	1.11		
1941	June	11	135.7	272,000	90	1.02		
1942	June	18	140.06	428,000	78	1.18		
1943	June	21	143.00	541,000	62	1.48		
1944	June	19	137.15	326,000	87	1.06		
1945	June	8	141.94	505,000	65	1.42		
1946	May	30	143.96	581,000	51	1.80		
1947	May	11	-	536,000	63	1.46		
1948	May	31	-	999,000	3	30.7		
Period 1858-1948				610,500	Mean annual			

b Corrected.

## KOOTENAI RIVER BASIN

Kootenai River at Libby, Mont.

Location.- Lat. 48°24', long. 115°33', 1,200 feet downstream from highway bridge at Libby and half a mile downstream from Libby Creek. Prior to Apr. 28, 1931, at highway bridge at different datum.

Drainage area.- 10,240 square miles.

Records available.- October 1910 to September 1948 (1934 fragmentary).

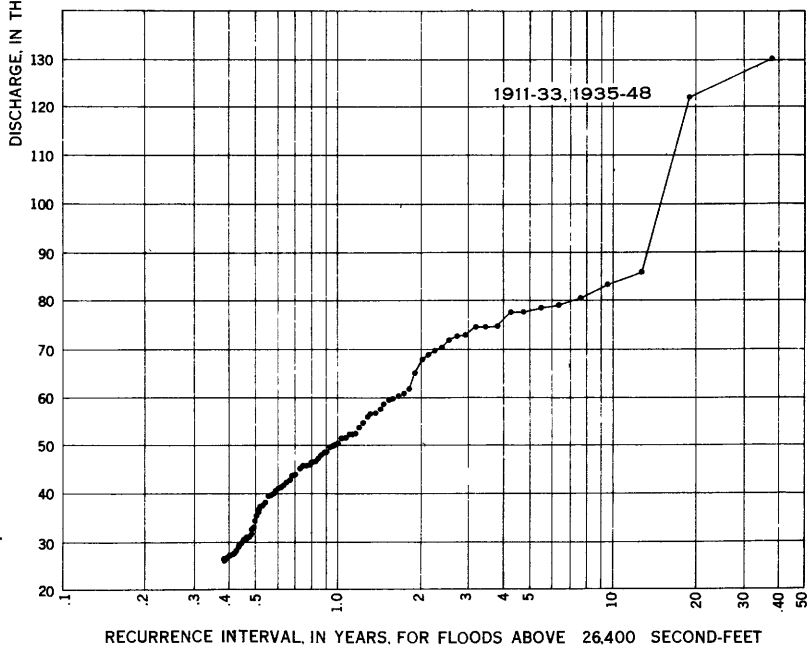
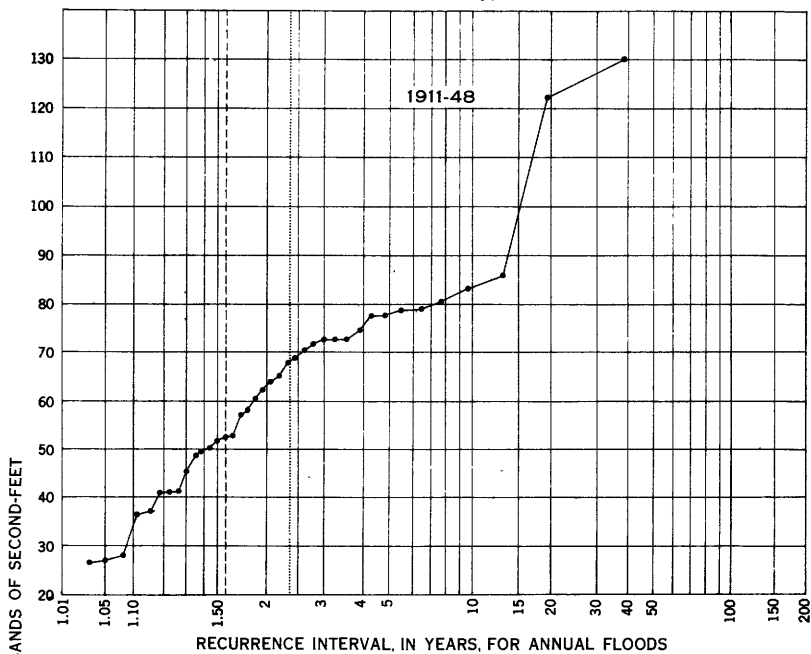
Gage.- Non-recording gage read twice daily 1911-19, 1928-29; once daily 1920-27, 1930 to Apr. 27, 1931. Recording gage thereafter.

Stage-discharge relation.- Defined by current-meter measurements below 87,000 second-feet.

Maximum flood of record.- 130,000 second-feet June 21, 1916.

Remarks.- No diversion or regulation. Gage heights for period when non-recording gage was used are from graphs based on gage readings.

Kootenai River at Libby, Mont.



## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

## KOOTENAI RIVER BASIN

Kootenai River at Libby, Mont.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1911	May	8	8.2	27,600	12	3.25	93	0.41
		18	8.5	29,500			88	.43
	June	4	12.4	59,500			25	1.52
		16	13.8	72,500			13	2.92
1912	May	18	9.6	36,800	34	1.15	74	.51
		28	8.6	30,100			86	.44
	June	19	9.4	35,400			76	.50
		15	8.3	27,600			94	.40
1913	June	4	14.3	77,300	8	4.88	8	4.75
		11	14.0	74,400			10	3.80
1914	May	5	8.7	30,700	23	1.70	83	.46
		18	10.5	43,500			57	.67
	June	5	12.1	56,900			28	1.36
		20	12.0	56,000			30	1.27
1915	May	6	9.9	39,000	35	1.11	69	.55
		11	8.2	27,600			95	.40
	June	28	9.5	36,100			75	.51
		8	10.1	40,400			65	.58
1916	May	21	19.24	130,000	1	39.0	1	38.0
		16	9.77	38,200			70	.54
	June	29	10.83	45,900			49	.78
		11	12.28	58,600			26	1.46
1917	May	18	12.99	65,000	18	2.17	20	1.90
		6	9.69	37,500			73	.52
	June	17	8.73	30,700			84	.45
		13	14.29	77,300			9	4.22
1918	May	30	8.71	30,700	9	4.33	85	.45
		17	8.73	30,700			5	7.60
	June	29	14.59	80,200			36	1.06
		23	11.47	51,700			36	1.06
1919	Apr.	13	8.06	27,000	5	7.80	97	.39
		19	11.64	52,500			33	1.15
	May	4	12.51	60,400			23	1.65
		27	13.48	69,600			17	2.24
1920	May	9	13.84	72,500	13	3.00	14	2.71
		24	10.82	45,900			50	.76
	June	20	10.39	42,700			58	.66
		6	13.45	68,700			18	2.11
1921	May	24	10.20	41,200	16	2.44	61	.62
		14	13.67	71,500			15	2.53
	June	18	10.74	45,100			52	.73
		23	14.38	78,200			7	5.42
1922	May	23	10.68	45,100	7	5.57	53	.72
		23	10.68	45,100			53	.72
	June	1	8.04	26,400			101	.38
		29	8.40	28,800			89	.43
1923	Apr.	18	9.99	39,700	4	9.75	68	.56
		12	14.90	83,100			4	9.50
	May	27	13.85	70,200			16	2.38
		2	10.17	42,300			59	.64
1924	May	25	11.67	53,500	15	2.60	32	1.19
		4	12.17	57,400			27	1.41
	June	21	8.00	28,100			90	.42
		1	11.46	52,100			35	1.09
1925	May	10	11.17	50,000	25	1.56	40	.95
		17	10.66	41,200			62	.61
	June	4	8.70	29,600			87	.44
		20	8.39	27,900			91	.42
1926	May	15	11.75	47,100	31	1.26	45	.84
		23	13.27	56,800			29	1.31
	June	5	13.87	60,800			22	1.73
		16	14.06	62,000			21	1.81

KOOTENAI RIVER BASIN  
Kootenai River at Libby, Mont.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-foot)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1933	Apr. June	29	9.21	31,600	3	13.0	80	0.48
		6	13.80	59,700			24	1.58
		18	16.90	85,600			3	12.7
1934	Apr. May	29	14.04	61,000	19	2.05	-	-
		18	13.64	58,400			-	-
		31	14.39	63,700			-	-
1935	May June	24	12.66	52,500	24	1.62	34	1.12
		2	11.79	46,900			46	.83
1936	Apr. May June	24	8.21	27,300	28	1.39	96	.40
		16	11.59	45,700			51	.74
		1	12.18	49,400			41	.93
1937	May June	28	10.76	41,000	32	1.22	63	.60
		4	10.65	39,900			67	.57
		19	10.21	37,600			72	.53
1938	Apr. May June	19	9.94	35,000	6	6.50	77	.49
		3	9.58	33,200			78	.49
		28	15.60	78,800			6	6.33
		24	12.17	50,500			38	1.00
1939	May June July	5	9.28	32,800	33	1.18	79	.48
		18	10.80	41,000			64	.59
		31	10.00	40,000			66	.58
		2	9.04	31,200			81	.47
1940	May June	13	10.35	38,200	29	1.35	71	.54
		26	11.88	48,500			42	.90
		15	9.06	31,200			82	.46
1941	May	19	8.18	26,800	37	1.05	98	.39
1942	May June July	13	11.74	46,500	17	2.30	47	.81
		27	14.45	67,900			19	2.00
		9	12.79	54,600			31	1.23
		4	11.69	46,500			48	.79
1943	Apr. May June July	21	11.26	43,800	27	1.44	55	.69
		29	11.86	47,900			44	.86
		19	12.19	50,100			39	.97
		4	11.32	43,800			54	.70
1944	May June	21	8.18	26,800	36	1.08	99	.38
		1	8.44	27,800			92	.41
1945	June	2	12.44	51,600	28	1.50	37	1.03
		23	10.92	41,800			60	.63
1946	May	7	11.25	43,800	10	3.90	56	.68
		30	15.12	74,300			11	3.46
1947	May June	11	15.06	74,300	11	3.54	12	3.16
		4	11.87	48,500			43	.88
1948	May	1	8.12	26,800	2	19.5	100	.38
		28	19.93	122,000			2	19.0
Period 1911-48				62,530	Mean annual			

## KOOTENAI RIVER BASIN

Kootenai River at Leonia, Idaho

Location.- Lat. 48°37', long. 116°03', at Leonia, 450 feet east of Montana-Idaho State line and half a mile upstream from Boulder Creek.

Drainage area.- 11,740 square miles.

Records available.- March 1928 to September 1948.

Gage.- Non-recording gage read once or twice daily prior to Nov. 13, 1928, recording gage thereafter. Datum of non-recording gage was 1,799.58 feet above mean sea level, that of recording gage is 1,700.00 feet above mean sea level (U. S. Coast and Geodetic Survey datum).

Stage-discharge relation.- Defined by current-meter measurements.

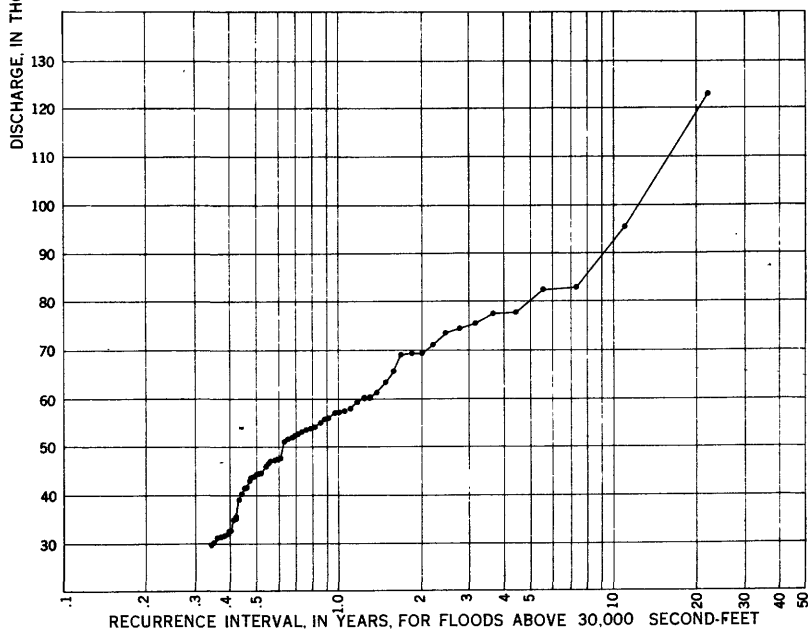
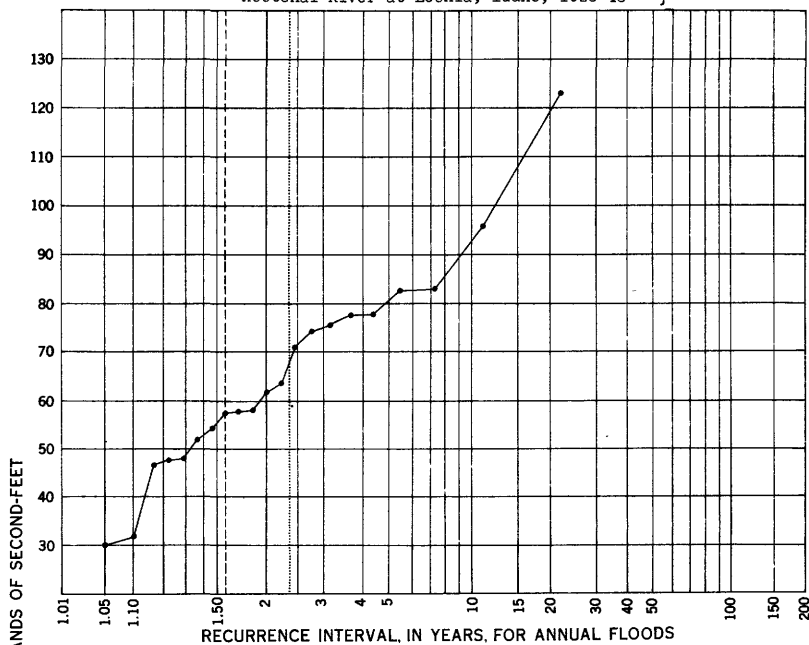
Maximum flood of record.- 123,000 second-feet May 28, 1948.

Historical data.- Floods of June 1894 and 1916 reached elevations of 1,824.6 and 1,821.6 feet, respectively (discharge not determined), from information by Great Northern Railway Co.

Remarks.- No diversion or regulation above station. Gage heights for period when non-recording gage was used are from graphs based on gage readings. Major shift in stage-discharge relation occurred after June 1933 flood.

Year	Month	Day	Elevation (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1928	Apr.	29	1,808.90	32,800	5	4.40	56	0.39
	May	25	1,816.05	77,500			5	4.40
	July	2	1,811.02	44,000			45	.49
1929	May	25	1,813.30	60,300	11	2.00	17	1.29
	June	4	1,813.47	61,600			16	1.37
1930	May	21	1,808.24	31,400	14	1.57	62	.36
	June	1	1,812.72	57,300			23	.96
		10	1,812.24	54,400			27	.81
1931	May	17	1,810.97	46,600	19	1.16	40	.55
	June	4	1,808.12	31,600			59	.37
		11	1,807.76	30,200			63	.35
1932	May	15	1,813.55	60,100	9	2.44	18	1.22
		23	1,814.96	69,400			12	1.83
	June	5	1,815.04	69,400			11	2.00
		16	1,814.99	71,000			10	2.20
1933	Apr.	29	1,811.09	44,800	2	11.0	43	.51
	June	7	1,815.50	73,200			9	2.44
		18	1,818.11	95,500			2	11.0
1933	Dec.	23	1,811.66	46,000	7	3.14	41	.54
1934	Apr.	29	1,816.40	75,200			7	3.14
	May	18	1,815.09	65,900			14	1.57
		30	1,815.55	69,100			13	1.69
1935	May	7	1,809.60	31,600	10	2.20	60	.37
	June	24	1,815.04	63,600			15	1.47
		2	1,813.85	56,100			24	.92
1936	Apr.	23	1,810.13	35,500	15	1.47	53	.42
	May	17	1,813.23	53,900			29	.76
	June	1	1,813.29	54,200			28	.79
1937	May	28	1,812.40	47,900	17	1.29	36	.61
	June	5	1,811.79	44,600			44	.50
		19	1,811.23	41,800			49	.45
1938	Apr.	19	1,813.33	53,500	3	7.33	30	.73
	May	2	1,811.79	44,900			42	.52
		28	1,817.64	83,000			3	7.33
	June	24	1,813.20	53,000			31	.71
1939	May	4	1,810.90	40,100	18	1.22	50	.44
		18	1,812.11	47,500			37	.59
		31	1,811.12	41,900			48	.46
	July	2	1,809.12	33,000			55	.40
1940	May	13	1,811.55	44,000	16	1.37	46	.48
	June	26	1,812.92	52,000			34	.65
		15	1,809.00	32,300			57	.39
1941	May	17	1,809.05	31,900	20	1.10	58	.38

Kootenai River at Leonia, Idaho, 1928-48





## KOOTENAI RIVER BASIN

## Kootenai River at Leonia, Idaho--Continued

Year	Month	Day	Elevation (feet)	Discharge (second-foot)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1942	May	13	1,813.81	52,700	8	2.75	32	0.69
		27	1,816.60	74,500			8	2.75
	June	9	1,814.40	59,600			19	1.16
		17	1,812.36	47,100			39	.56
	July	2	1,813.05	51,100			35	.63
1943	Apr.	21	1,814.28	57,500	12	1.83	22	1.00
	May	29	1,814.37	58,000			20	1.10
	June	19	1,814.03	56,000			25	.88
	July	4	1,812.57	47,400			38	.58
1944	June	1	1,808.80	30,000	21	1.05	64	.34
1945	May	7	1,809.15	31,500	13	1.69	61	.36
	June	2	1,814.32	57,700			21	1.05
		23	1,811.78	43,200			47	.47
1946	Apr.	28	1,810.19	35,900	6	3.67	52	.42
	May	7	1,813.84	55,100			26	.85
		30	1,816.92	77,100			6	3.67
1947	May	11	1,817.56	82,500	4	5.50	4	5.50
		28	1,813.06	52,200			33	.67
1947	Oct.	20	1,810.84	39,000	1	22.0	51	.43
1948	Apr.	23	1,810.03	35,100			54	.41
	May	28	1,823.40	123,000			1	22.0
Period 1928-48				65,110	Mean annual			

## Kootenai River at Bonners Ferry, Idaho

Location.- Lat. 48°42'00", long. 116°18'45", on highway bridge at Bonners Ferry.

Drainage area.- 13,000 square miles.

Records available.- October 1927 to September 1948; gage heights only prior to April

1928. May to October 1904, gage heights at site three-quarters of a mile down-

stream. Gage heights collected by U. S. Weather Bureau May 1904 to September 1927.

Gage.- Non-recording gage read twice daily. Beginning May 9, 1942, water-stage record-

er across river at same datum used as supplemental gage. Datum of gage is at mean

sea level (U. S. Coast and Geodetic Survey datum).

Stage-discharge relation.- Backwater effect from Kootenay Lake usually present at

Bonners Ferry and discharge computed by stage-fall-discharge relation or other

special means, defined by current-meter measurements.

Maximum flood of record.- 139,000 second-feet May 27, 1948; maximum daily discharge,

130,000 second-feet May 28, 29, 1948.

Historical data.- Flood of June 1894 reached an elevation of 1,777.2 feet (discharge

not determined).

Remarks.- No diversion or regulation above station. Gage heights are the average of

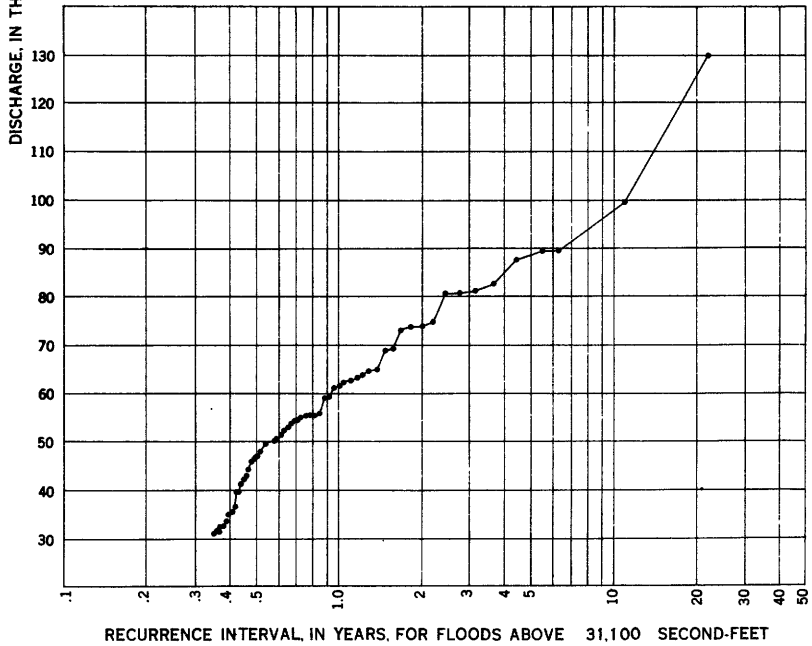
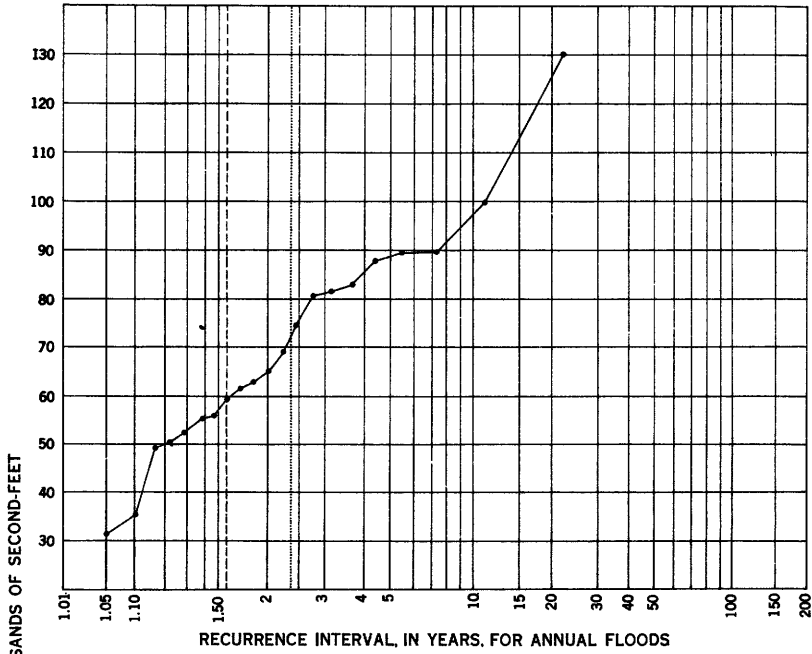
twice-daily gage readings prior to May 9, 1942; thereafter based on correlation

curve between recording and non-recording gages. Daily discharges are listed

throughout.

Year	Month	Day	Elevation (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1928	Apr.	29	1,757.34	36,600	6	3.67	53	0.42
		25	1,772.15	82,800			6	3.67
		3	1,765.23	45,900			46	.48
1929	May	25	1,765.21	62,700	12	1.83	20	1.10
		4	1,766.36	62,200			21	1.05
1930	May	22	1,758.39	33,700	14	1.57	57	.39
		2	1,764.89	59,200			25	.88
		10	1,764.72	55,600			29	.76
1931	May	17	1,762.30	49,400	19	1.16	40	.55
		4	1,758.09	31,900			60	.37
1932	May	14	1,767.24	64,500	9	2.44	17	1.29
		23	1,769.70	74,700			10	2.20
		5	1,769.75	73,700			12	1.83
		16	1,770.38	73,000			13	1.69
1933	Apr.	29	1,761.64	50,000	2	11.0	39	.56
		6	1,771.74	80,900			8	2.75
		18	1,774.74	99,800			2	11.0

Kootenai River at Bonners Ferry, Idaho, 1928-48



## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

## KOOTENAI RIVER BASIN

Kootenai River at Bonners Ferry, Idaho--Continued

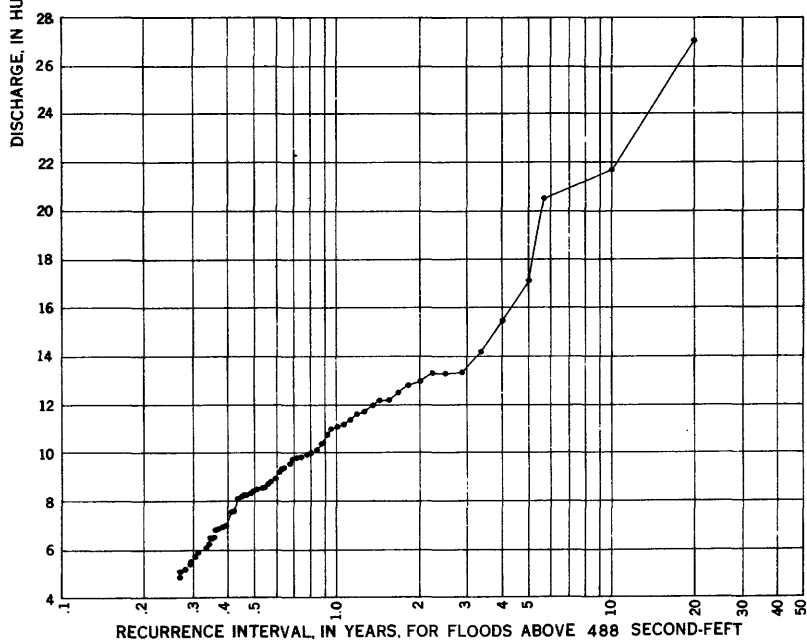
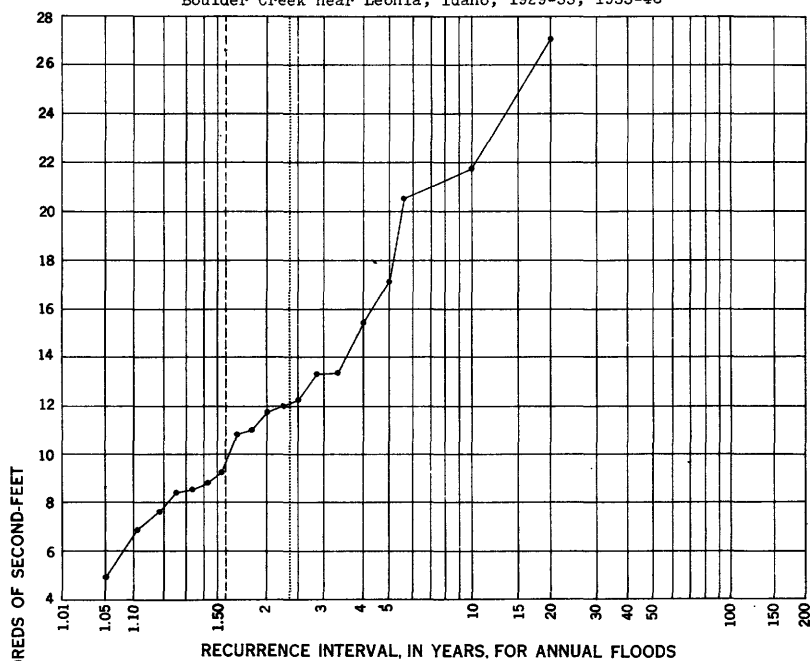
Year	Month	Day	Elevation (feet)	Discharge (second-foot)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1933	Dec.	23	1,760.36	47,000	5	4.40	43	0.51
1934	Apr.	29	1,772.99	87,800			5	4.40
	May	18	1,770.24	69,100			14	1.57
		31	1,771.44	73,900			11	2.00
1935	May	7	1,757.86	35,500	10	2.20	54	.41
		24	1,768.30	69,000			15	1.47
	June	2	1,768.12	61,200			23	.96
1936	Apr.	24	1,760.16	41,200	15	1.47	50	.44
	May	17	1,766.70	55,700			27	.81
	June	1	1,766.50	55,700			28	.79
1937	May	28	1,764.13	52,300	17	1.29	35	.63
		4	1,763.71	47,900			42	.52
	June	19	1,763.84	46,100			45	.49
1938	Apr.	19	1,763.13	56,000	3	7.33	26	.85
	May	2	1,763.35	50,500			37	.59
		27	1,772.50	89,800			3	7.33
	June	23	1,767.61	54,500			31	.71
1939	May	4	1,761.40	44,200	18	1.22	47	.47
		18	1,763.50	50,200			38	.58
		31	1,761.85	42,900			48	.46
	July	2	1,758.25	32,800			58	.38
1940	May	13	1,761.34	46,900	16	1.38	44	.50
		26	1,764.84	55,100			30	.73
	June	15	1,758.59	32,800			59	.37
1941	May	18	1,758.62	35,200	20	1.10	55	.40
1942	May	14	1,763.56	53,000	7	3.14	34	.65
		27	1,771.22	81,100			7	3.14
	June	8	1,768.18	63,200			19	1.16
		17	1,764.32	49,400			41	.54
	July	1	1,764.98	53,800			33	.67
1943	Apr.	21	1,767.48	65,000	11	2.00	16	1.38
	May	29	1,767.92	63,700			18	1.22
	June	19	1,766.69	59,400			24	.92
	July	4	1,764.74	51,300			36	.61
1944	June	1	1,756.70	31,100	21	1.05	62	.35
1945	May	7	1,757.10	35,100	13	1.69	56	.39
		2	1,766.58	61,300			22	1.00
	June	23	1,761.84	42,100			49	.45
1946	Apr.	21	1,755.75	31,800	8	2.75	61	.36
	May	30	1,772.95	80,500			9	2.44
1947	May	11	1,774.18	89,600	4	5.50	4	5.50
		28	1,765.96	54,500			32	.69
1947	Oct.	21	1,760.50	39,600	1	22.0	52	.42
1948	Apr.	23	1,758.19	39,700			51	.43
	May	29	1,778.10	c103,000			1	22.0
Period 1928-48				68,350	Mean annual			

c Daily discharge for May 28, 103,000 second-feet (elevation 1,777.88 feet).

## Boulder Creek near Leonia, Idaho

Location.- Lat. 48°36', long. 116°06', half a mile downstream from McGinty Creek, 3 miles upstream from mouth, and 3 miles southwest of Leonia.Drainage area.- 53 square miles.Records available.- November 1928 to September 1948. April to November 1928 at site 1½ miles downstream.Gage.- Non-recording gage read twice daily prior to November 1928, once daily January to September 1934. Recording gage after November 1928, except for period January to September 1934.Stage-discharge relation.- Defined by current-meter measurements below 1,680 second-feet and by contracted-opening measurement of maximum discharge.Maximum flood of record.- 2,700 second-feet Oct. 19, 1947.Remarks.- Negligible diversion prior to 1936, none thereafter. No regulation. Peak discharges for 1934 water year omitted because of incomplete data. Major shift in stage-discharge relation after December 1933 flood.

Boulder Creek near Leonia, Idaho, 1929-33, 1935-48



## KOOTENAI RIVER BASIN

Boulder Creek near Leonia, Idaho--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1929	Apr.	27	3.50	590	14	1.43	64	0.31
	May	12	4.10	880			35	.57
1930	Apr.	8	3.40	545	18	1.11	70	.29
		14	3.70	683			55	.36
		22	3.43	558			67	.30
1931	May	2	4.00	840	16	1.25	41	.49
		13	3.87	758			49	.41
1932	Feb.	27	4.94	1,330	6	3.33	7	2.86
	Apr.	13	3.77	704			50	.40
	May	7	4.80	1,330			8	2.50
	June	21	4.16	848			39	.51
		2	3.79	656			56	.36
1932	Nov.	13	3.80	656	7	2.86	57	.35
	Dec.	2	3.52	516			73	.27
1933	Apr.	28	4.67	1,220			13	1.54
	May	14	4.17	848			40	.50
		26	4.79	1,330			9	2.22
		30	4.53	1,160			17	1.18
	June	4	4.33	1,040			23	.87
		8	4.76	1,300			10	2.00
1934	Nov.	7	4.40	1,540	5	4.00	5	4.00
1935	May	5	3.54	980			27	.74
		22	3.93	1,280			11	1.82
1936	Apr.	(a)	3.75	1,100	11	1.82	21	.95
		25	3.47	938			31	.64
	May	4	3.55	1,010			24	.83
		11	3.45	950			30	.67
1937	May	4	3.40	920	13	1.54	33	.61
		25	3.35	890			34	.59
1938	Apr.	18	5.50	2,050	3	6.67	3	6.67
	May	30	3.52	990			26	.77
		25	3.72	1,110			20	1.00
1939	Apr.	21	2.73	524	15	1.33	71	.28
	May	29	3.30	815			45	.44
		3	3.36	854			37	.54
		14	2.80	575			66	.30
1940	May	3	3.08	700	17	1.18	52	.38
		11	3.20	760			47	.42
1941	May	17	4.05	1,200	9	2.22	15	1.33
1941	Dec.	2	5.61	2,170	2	10.0	2	10.0
		20	3.67	1,120			19	1.05
1942	Apr.	22	3.22	871			36	.56
	May	9	2.70	610			61	.33
		25	2.88	700			53	.38
1943	Apr.	19	3.70	980	10	2.00	28	.71
	May	4	2.87	588			65	.31
		25	4.05	1,170			16	1.25
1944	May	9	2.62	488	19	1.05	74	.27
1945	May	5	3.90	1,080	12	1.67	22	.91
		15	3.40	830			42	.48
		26	2.90	600			62	.32
1946	Apr.	19	2.78	552	8	2.50	68	.29
		26	3.10	690			54	.37
		29	3.02	654			58	.34
	May	4	4.15	1,220			14	1.43
		11	3.49	825			43	.46
		17	3.76	970			29	.69
		25	3.41	810			46	.43
		28	3.65	930			32	.62
		June	3	2.96			63	.32
			6	3.45			44	.45
				825				

KOOTENAI RIVER BASIN  
Boulder Creek near Leonia, Idaho--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1947	April May	19	4.43	854	1	20.0	38	0.53
		2	5.09	1,160			18	1.11
		7	4.76	1,000			25	.80
	Oct.	20	3.69	551			69	.29
		25	3.62	523			72	.28
		16	4.07	703			51	.39
		19	7.85	2,700			1	20.0
1948	Apr. May	21 or 22	4.64	612	4	5.00	60	.33
		8	4.66	623			59	.34
	13	4.90	760	48			.42	
	20	5.71	1,250	12			1.67	
	24	5.96	1,410	6			3.33	
	27	6.42	1,710	4			5.00	
	Period 1929-33, 1935-48						1,264	Mean annual

d Between Apr. 19 and 23.

Moyle River at Eileen, Idaho

Location.- Lat. 48°46', long. 116°10', an eighth of a mile downstream from Skin Creek, a quarter of a mile southeast of Eileen, and 4 miles upstream from mouth.

Drainage area.- 755 square miles.

Records available.- October 1925 to September 1948.

Gage.- Non-recording gage read twice daily prior to June 1, 1928, recording gage there-after. Gage datum lowered 1 foot Oct. 11, 1944.

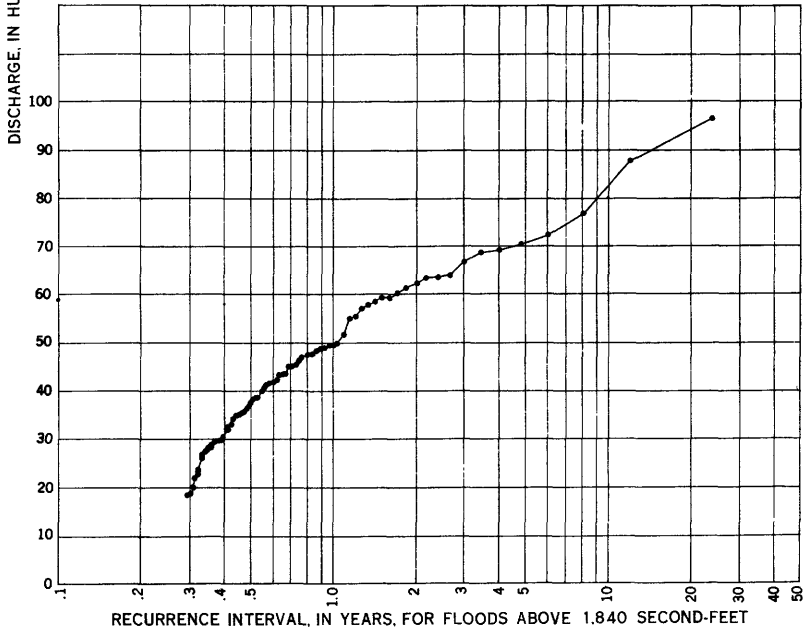
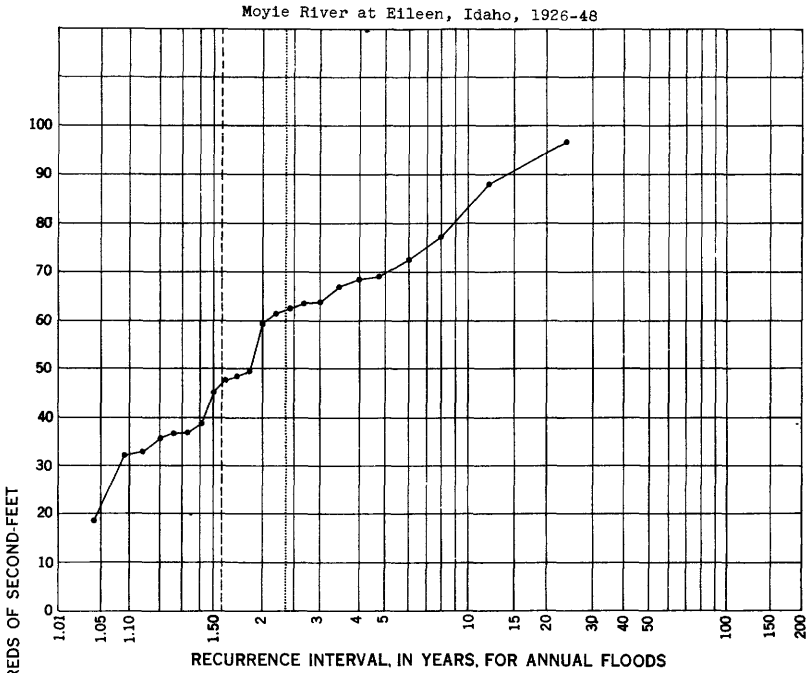
Stage-discharge relation.- Defined by current-meter measurements below 5,200 second-feet.

Maximum flood of record.- 9,850 second-feet May 26, 1948.

Remarks.- No diversion or regulation above station. Gage heights for period when non-recording gage was used are from graphs based on gage readings. Major change in stage-discharge relation occurred during floods of May 1932.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1926	Apr.	20	3.64	2,570	22	1.09	73	0.33
		30	3.90	3,200			59	.41
1927	Apr.	28	4.46	4,890	12	2.00	27	.89
		17	4.80	5,910			15	1.60
		10	4.80	5,910			16	1.50
1928	Apr.	28	3.97	s3,580	11	2.18	51	.47
		19	4.82	s6,150			13	1.85
1929	Apr.	29	3.07	1,860	14	1.71	80	.30
		24	4.33	4,820			28	.86
		9	3.60	2,760			69	.35
		14	3.56	2,660			72	.33
1930	Apr.	15	3.56	2,260	18	1.33	76	.32
		27	3.97	3,540			53	.45
		21	3.68	2,930			64	.38
		31	4.00	3,680			49	.49
1931	May	7	3.70	2,930	20	1.20	65	.37
		15	3.95	3,540			54	.44
1932	Apr.	14	3.50	2,720	6	4.00	71	.34
		23	3.53	2,820			67	.36
		14	4.15	6,340			10	2.40
	May	22	4.24	6,840			7	3.43
		2	3.90	5,120			22	1.09
1933	Apr.	29	4.02	5,670	8	3.00	19	1.26
		15	3.70	4,310			38	.63
		31	4.16	6,390			9	2.67
		16	4.05	5,820			17	1.41

FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN



KOOTENAI RIVER BASIN  
 Moyie River at Eileen, Idaho--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-foot)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1933	Dec.	23	3.29	3,030			61	0.39
1934	Apr.	9	3.55	3,780			48	.50
		14	3.78	4,620			32	.75
		29	4.55	8,780			2	12.0
		16	3.86	4,950	2	12.0	24	1.00
1935	Apr.	21	2.95	2,380			74	.32
		26	3.25	2,940			63	.38
	May	6	3.62	3,850			45	.53
		23	4.16	6,230	10	2.40	12	2.00
1936	Apr.	20	3.90	4,900			26	.92
		23	3.87	4,770			30	.80
		26	3.91	4,950			25	.96
	May	5	3.70	4,110	13	1.85	42	.57
		12	3.72	4,150			41	.58
1937	May	5	3.62	3,850	17	1.41	46	.52
		27	3.61	3,820			47	.51
	June	20	3.18	2,800			68	.35
1938	Apr.	18	4.39	7,680	3	8.00	3	8.00
		1	4.07	5,730			18	1.33
		26	4.25	7,020			5	4.80
1939	Apr.	4	2.43	1,860			81	.30
		22	3.03	3,050			60	.40
	May	4	3.54	4,500	16	1.50	34	.71
		16	3.23	3,550			52	.46
1940	Apr.	15	2.55	2,010			78	.31
		3	2.97	2,730			70	.34
		12	3.39	3,630	19	1.26	50	.48
1941	May	2	2.66	2,190			77	.31
		17	3.24	3,290	21	1.14	57	.42
1941	Dec.	3	3.62	4,210			39	.62
		20	2.73	2,300			75	.32
1942	Apr.	14		2,900			66	.36
		22	3.23	3,240			58	.41
	May	13	3.58	4,070			43	.56
		27	4.23	6,320	9	2.67	11	2.18
	June	5	3.89	4,990			23	1.04
		28	3.82	4,700			31	.77
1943	Apr.	19	4.35	6,680	7	3.43	8	3.00
		27	4.07	5,500			20	1.20
		June	19	3.40	3,540			55
1944	May	9	2.50	1,840	23	1.04	82	.29
1945	May	6	4.97	4,780	15	1.60	29	.83
		14	4.89	4,530			33	.73
		June	1	4.77	4,180			40
1946	Apr.	20	4.73	4,350			36	.67
		26	5.07	5,480			21	1.14
		May	6	5.41	6,900	5	4.80	6
1947	Apr.	2	3.52	1,870			79	.30
		20	4.73	4,350			37	.65
		29	5.21	6,030			14	1.71
	May	10	5.72	7,210	4	6.00	4	6.00
		10	4.36	2,980			62	.39
1947	Oct.	19	4.57	3,450			56	.43
1948	Apr.	23	4.96	4,500			35	.68
		30	4.78	3,990			44	.55
		May	26	6.51	9,650	1	24.0	1
Period 1926-48				5,514	Mean annual			

Estimated from daily discharge.

Computed on basis of records for station at Eastport.



## KOOTENAI RIVER BASIN

Deep Creek at Moravia, Idaho

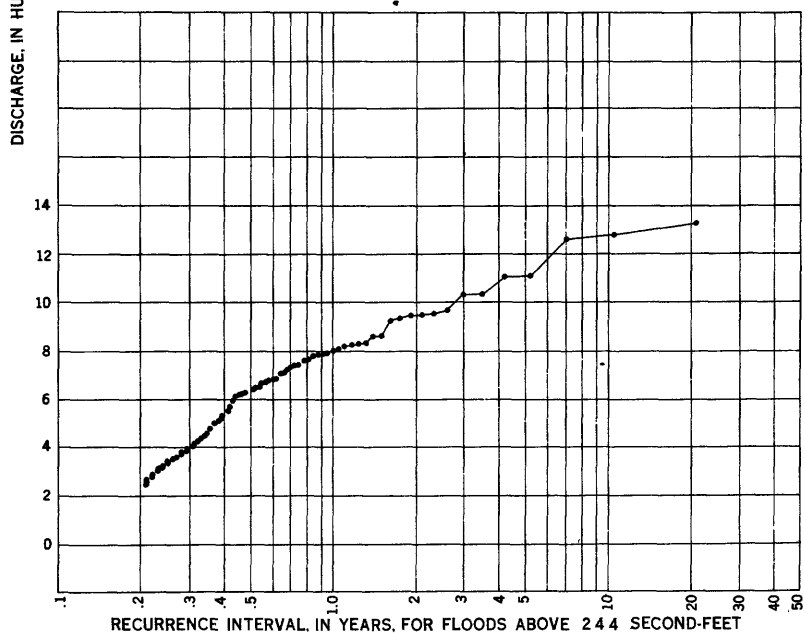
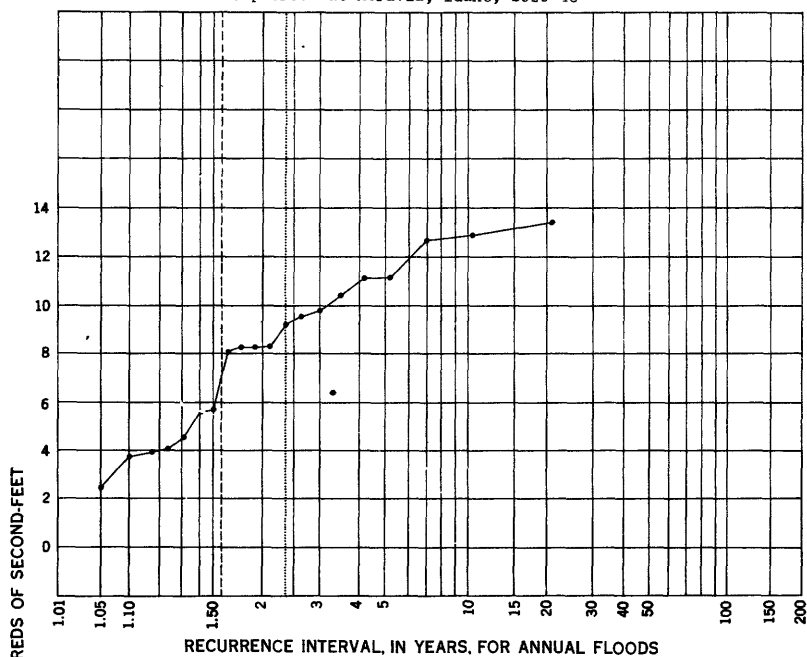
Location.- Lat. 48°38', long. 116°24', at concrete highway bridge, 1 mile downstream

from Ruby Creek and 1 mile southwest of Moravia.

Drainage area.- 133 square miles.Records available.- May 1928 to September 1948 (no winter records prior to 1933)Gage.- Non-recording gage read once daily.Stage-discharge relation.- Defined by current-meter measurements below 1,290 second-feet.Maximum flood of record.- 1,330 second-feet Dec. 22, 1933.Remarks.- Small diversion above station for irrigation. Gage heights are from graphs based on gage readings.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1929	May	3	1.83	290	18	1.17	94	0.22
		13	1.98	358			80	.26
		23	2.05	390			73	.29
	June	2	1.69	259			100	.21
1930	Apr.	9	1.90	330	17	1.23	86	.24
		14	2.10	403			68	.31
		24	2.03	378			75	.28
1931	Apr.	8	2.25	374	19	1.10	76	.28
	May	4	2.02	309			92	.23
		14	2.05	318			90	.23
1932	Feb.	27	3.3	819	11	1.91	19	1.10
	Apr.	4	2.55	534			53	.40
		14	3.16	765			26	.81
	May	8	3.15	761			27	.78
		22	3.32	827			17	1.23
	June	3	2.19	398			71	.50
1932	Nov.	13	2.20	402	7	3.00	69	.50
		13	1.82	269			98	.21
		Dec.	2.30	440			64	.33
1933	Apr.	3	2.32	447	7	3.00	63	.33
		29	3.69	971			8	2.62
	May	14	2.88	658			39	.54
		26	2.96	689			34	.62
	June	9	2.94	681			36	.58
		15	3.02	711			32	.66
1933	Dec.	22	4.27	1,330	1	21.0	1	21.0
1934	Jan.	4	2.88	629			44	.48
		23	2.80	594			49	.43
	Apr.	1	2.97	670			38	.55
		8	2.88	629			45	.47
	May	14	3.05	708			33	.64
		28	3.73	1,040			6	3.50
1934	Nov.	11	2.30	397	12	1.75	72	.29
		7	1.87	264			99	.21
	Jan.	25	3.00	6400			70	.30
		Mar.	2.07	328			87	.24
	Apr.	22	2.88	675			37	.57
		25	2.84	656			40	.52
1935	May	7	3.30	825	10	2.10	18	1.17
		22	3.22	790			24	.88
	Apr.	25	3.66	950			10	2.10
1936	May	4	3.02	639	8	2.62	42	.50
		25	3.40	830			16	1.31
	Apr.	29	2.62	502			57	.37
1937	May	4	3.23	745	10	2.10	28	.75
		20	2.57	484			58	.36
	Nov.	25	2.48	453			61	.34
1937	Dec.	30	3.06	686	3	7.00	35	.60
		15	2.56	506			56	.38
	Jan.	16	3.10	735			31	.68
		18	4.20	1,260			3	7.00
	Apr.	3	3.64	955			9	2.33
		26	3.21	745			29	.72
1939	Mar.	26	1.93	311	16	1.31	91	.23
		5	2.10	360			78	.27
	Apr.	19	2.00	331			85	.25
		30	2.43	459			60	.35
	May	15	2.08	354			81	.26

## Deep Creek at Moravia, Idaho, 1929-48



## KOOTENAI RIVER BASIN

## Deep Creek at Moravia, Idaho--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1940	Mar.	27	2.75	570	14	1.50	50	0.42
	May	2	2.08	354			82	.26
		11	2.10	360			79	.27
1941	May	17	2.72	558	15	1.40	51	.41
1941	Dec.	3	3.18	742	9	2.33	30	.70
		20	3.58	921			13	1.62
1942	Apr.	14	2.35	420			67	.31
	May	12	1.88	284			96	.22
		27	2.46	453			62	.34
	June	26	1.94	300			93	.23
1943	Apr.	3	2.92	618	4	5.25	48	.44
		9	3.50	862			14	1.50
		16	4.12	1,110			4	5.25
	May	1	3.05	626			47	.45
		26	2.81	536			52	.40
	June	17	2.23	346			84	.25
1944	Apr.	12	1.88	244	20	1.05	101	.21
1945	Apr.	22	2.04	289	2	10.5	95	.22
	May	6	4.46	1,280			2	10.5
		15	3.45	792			22	.95
	June	4	2.50	430			65	.32
1946	Mar.	27	2.50	430	6	3.50	66	.32
	Apr.	19	3.42	779			25	.84
		26	3.48	806			20	1.05
		29	3.45	792			23	.91
	May	5	3.98	1,040			7	3.00
	June	6	2.72	525			54	.39
1947	Feb.	15	2.32	382	13	1.62	74	.28
	Mar.	24	2.14	327			88	.24
	Apr.	2	2.62	480			59	.36
		20	3.00	626			46	.46
		29	3.00	637			43	.49
	May	8	3.36	802			21	1.00
		26	2.20	361			77	.27
1947	Oct.	20	2.66	511	5	4.20	55	.38
1948	Jan.	15	2.00	277			97	.22
	Feb.	18	2.16	324			89	.24
	Apr.	3	2.10	348			83	.25
		22	3.68	932			12	1.75
	May	9	3.60	860			15	1.40
		13	3.78	941			11	1.91
		24	4.12	1,110			5	4.20
	June	4	3.02	649			41	.51
Period 1929-48				813	Mean annual			

e Estimated; stage-discharge relation affected by ice.

## Smith Creek near Porthill, Idaho

Location.- Lat. 48°57'40", long. 116°33'20", at U. S. Forest Service bridge, 1 mile south of Smith Creek ranger station and 4 miles southwest of Porthill.

Drainage area.- 70 square miles.

Records available.- May 1928 to September 1948 (no winter records 1928-30, 1932-34, incomplete records 1945).

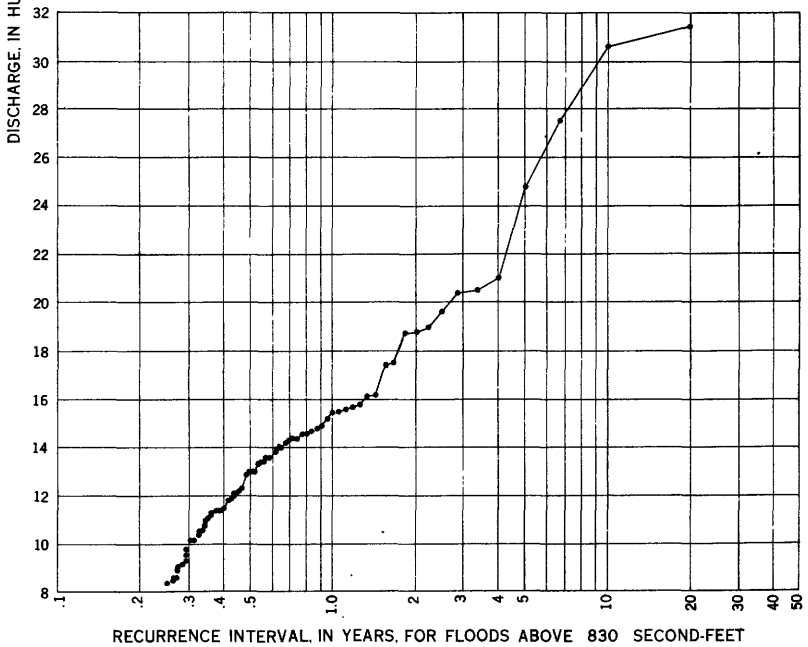
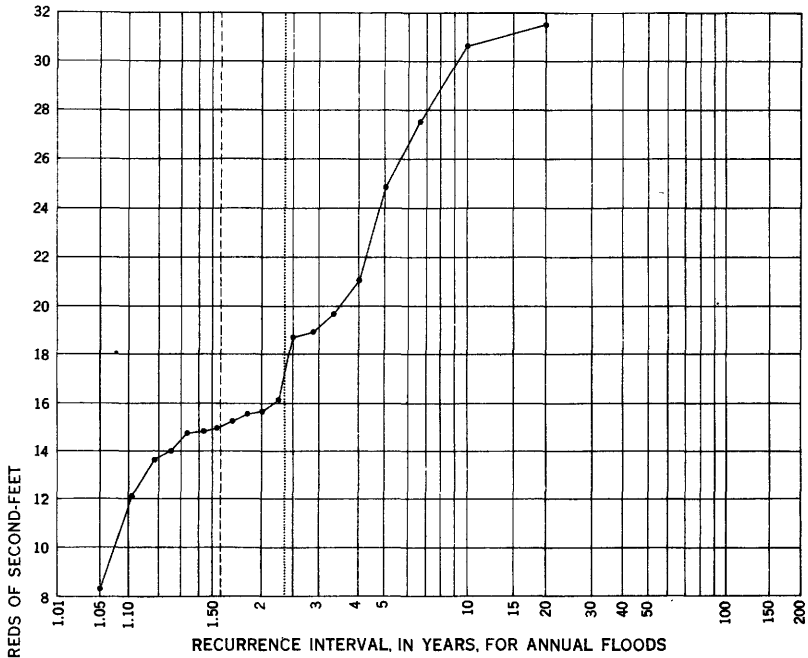
Gage.- Non-recording gage read once daily prior to Apr. 20, 1929, recording gage thereafter. Datum of non-recording gage was 2.67 feet lower than that of recording gage.

Stage-discharge relation.- Defined by current-meter measurements below 1,500 second-feet.

Maximum flood of record.- 3,150 second-feet May 17, 1941.

Remarks.- No diversion or regulation above station.

Smith Creek near Porthill, Idaho, 1929-44, 1946-48



KOOTENAI RIVER BASIN  
Smith Creek near Porthill, Idaho--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1929	May	14	4.65	1,010	14	1.43	67	0.30
		22	5.35	1,480			23	.87
		31	4.69	1,040			63	.32
	June	9	4.87	1,140			51	.39
		14	4.87	1,140			52	.38
1930	Apr.	14	4.50	920	18	1.11	71	.28
		24	4.95	1,210			45	.44
	May	20	4.75	1,080			59	.34
1931	May	6	4.85	1,140	10	2.00	53	.38
		14	5.45	1,560			18	1.11
1932	May	13	5.47	1,380	13	1.54	33	.61
		20	5.58	1,490			22	.91
	June	2	5.12	1,150			50	.40
		13	5.16	1,180			49	.41
1933	May	26	5.50	1,420	2	10.0	30	.67
		30	5.55	1,460			25	.80
	June	4	5.68	1,570			17	1.18
		14	7.15	3,060			2	10.0
1934	Apr.	13	4.60	830	6	3.33	78	.26
		28	6.20	1,960			8	2.50
	May	8	5.02	1,060			60	.33
		15	5.56	1,440			27	.74
		25	5.51	1,400			31	.64
1935	May	22	5.61	1,520	12	1.67	21	.95
		30	5.48	1,440			28	.71
	June	5	5.35	1,340			36	.56
1936	Apr.	25	4.65	858	15	1.33	76	.26
		4	5.33	1,300			39	.51
	May	14	5.58	1,470			24	.85
		29	4.67	858			75	.27
1937	May	26	5.37	1,300	11	1.82	40	.50
		2	5.44	1,360			34	.59
		19	5.68	1,550			19	1.05
1938	Apr.	18	6.30	2,050	5	4.00	6	3.33
		1	5.00	1,060			61	.33
	May	25	6.35	2,100			5	4.00
		13	5.23	1,220			44	.45
1939	Apr.	29	5.35	1,300	16	1.25	41	.49
		3	5.41	1,330			38	.53
	May	15	5.50	1,400			32	.62
		29	4.66	840			77	.26
1940	May	3	4.93	1,020	17	1.18	65	.31
		11	5.44	1,360			35	.57
		23	4.95	1,020			64	.31
1941	May	1	4.83	960	1	20.0	69	.29
		17	7.36	3,150			1	20.0
1941	Dec.	2	7.00	2,750	3	6.67	3	6.67
1942	May	23	5.48	1,430			29	.69
		7	4.58	830			79	.25
	June	15	4.92	1,020			66	.30
1943	Apr.	20	4.98	1,130	8	2.50	55	.36
		26	5.60	1,550			20	1.00
	June	9	5.10	1,200			47	.43
		17	6.00	1,870			10	2.00
	July	4	4.58	890			74	.27
1944	May	9	4.42	830	19	1.05	80	.25
1945f	May	6	4.68	950				
		14	4.79	1,040				
1946	May	5	5.12	1,210	7	2.86	46	.43
		8	4.99	1,120			56	.36
		13	5.02	1,140			54	.37
		17	5.45	1,460			26	.77
		25	5.88	1,870			11	1.82
		3	5.16	1,340			37	.54
	June	6	5.86	1,890			9	2.22
		14	4.83	1,110			57	.35
		20	4.54	934			70	.29

KOOTENAI RIVER BASIN  
Smith Creek near Porthill, Idaho--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1947	Apr. May	29	4.72	1,060	9	2.22	62	0.32
		8	5.64	1,610			15	1.33
		21	4.59	978			68	.29
		26	5.13	1,290			42	.48
	June	30	4.49	910			73	.27
		9	4.97	1,190			48	.42
1947	Oct.	16	4.81	1,100	4	5.00	58	.34
1948	May	19	6.32	2,040			7	2.86
		21	6.04	1,580			16	1.25
	June	27	7.37	2,480			4	5.00
		2	6.23	1,740			13	1.54
		7	6.42	1,850			12	1.67
		11	6.04	1,620			14	1.43
		16	5.38	1,230			43	.46
		24	4.82	911			72	.28
Period 1929-44, 1946-48				1,828			Mean annual	

f Incomplete year.

Boundary Creek near Porthill, Idaho  
(International gaging station)

Location.- Lat. 48°59'50", long. 116°34'05", 140 feet downstream from bridge at mouth of canyon, 0.2 mile south of international boundary, and 3 miles west of Porthill.

Drainage area.- 97 square miles.

Records available.- May 1928 to September 1948 (no winter records for water years 1929-30).

Gage.- Non-recording gage read two or three times weekly during summer months prior to April 24, 1929, recording gage thereafter.

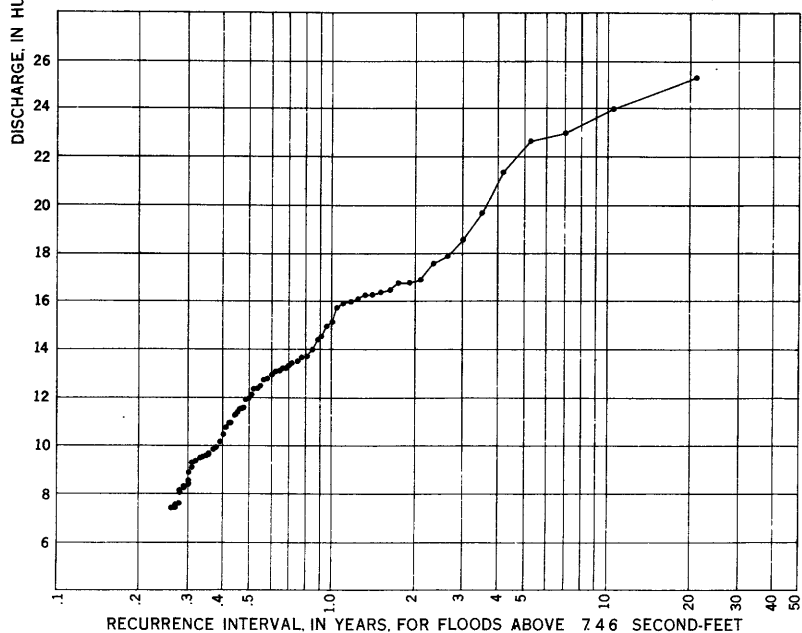
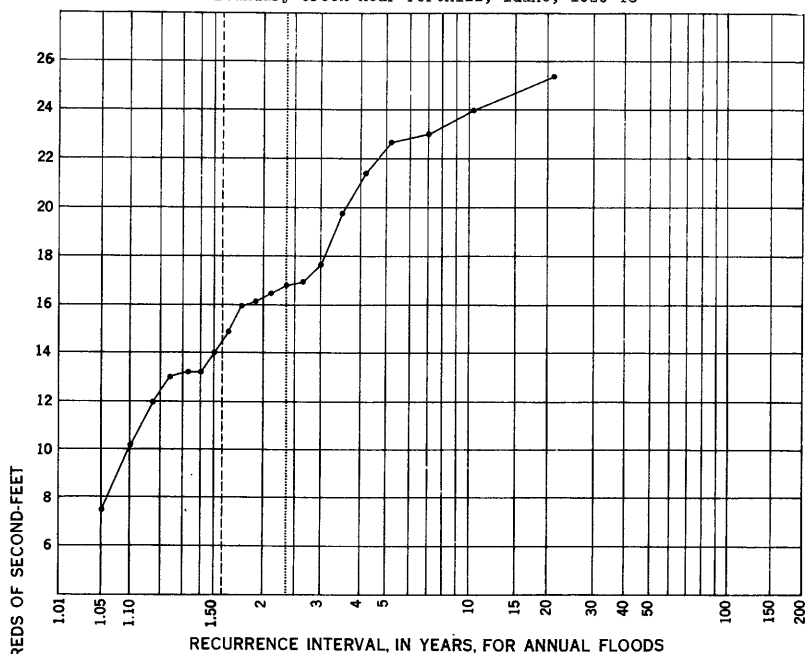
Stage-discharge relation.- Defined by current-meter measurements below 1,430 second-feet.

Maximum flood of record.- 2,530 second-feet May 28, 1948.

Remarks.- No diversion above station. This is one of the international gaging stations maintained by the United States under agreement with Canada.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1929	May	14	3.56	988	17	1.24	57	0.37
		23	4.02	1,300			35	.60
		31	3.49	955			62	.34
	June	8	3.63	1,050			52	.40
1930	Apr. May	24	3.50	950	19	1.10	63	.33
		20	3.61	1,020			53	.40
1931	May	6	3.51	950	15	1.40	64	.33
		13	4.03	1,320			31	.68
1932	May	12	4.25	1,510	9	2.33	21	1.00
		20	4.44	1,680			11	1.91
	June	2	3.98	1,310			33	.64
1933	Apr. May	13	4.02	1,310	2	10.5	34	.62
		28	3.29	820			74	.28
		15	3.38	885			69	.30
		26	4.43	1,680			12	1.75
	June	30	4.30	1,590			19	1.10
		4	4.62	1,860			7	3.00
		15	5.22	2,400			2	10.5
1934	Apr.	13	3.46	851	7	3.00	70	.30
		28	4.66	1,760			9	2.33
	May	15	4.20	1,370			26	.81
		24	3.92	1,160			44	.48
1935	May	5	3.24	747	12	1.75	78	.27
		22	4.45	1,600			18	1.17
		30	4.25	1,440			24	.88
	June	5	4.07	1,280			36	.58
1936	Apr. May	25	3.67	968	13	1.62	58	.36
		4	4.04	1,250			38	.55
		14	4.37	1,490			22	.95
		27	3.40	815			75	.28

Boundary Creek near Porthill, Idaho, 1929-48



KOOTENAI RIVER BASIN  
Boundary Creek near Porthill, Idaho--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1937	May June	26	3.98	1,280	16	1.31	37	0.57
		2	4.07	1,320			32	.66
		18	3.56	960			60	.35
1938	May June June	18	3.55	960	4	5.25	61	.34
		1	3.76	1,100			49	.43
		25	5.12	2,270			4	5.25
		13	3.85	1,160			45	.47
1939	Apr. May	29	3.80	1,130	14	1.50	48	.44
		3	3.93	1,240			39	.54
		15	4.13	1,400			25	.84
		29	3.35	840			71	.30
1940	May	3	3.43	830	18	1.17	73	.29
		11	4.01	1,200			42	.50
1941	May	1	3.65	1,020	3	7.00	54	.39
		17	5.1	2,300			3	7.00
1941	Dec.	2	3.88	1,200	11	1.91	43	.49
1942	May	23	4.50	1,610			17	1.24
1943	Apr. May June	20	3.71	990	5	4.20	56	.38
		26	4.45	1,630			15	1.40
		9	3.84	1,160			46	.46
		17	5.05	2,140			5	4.20
1944	May	15	3.23	746	20	1.05	79	.27
1945	May	6	3.33	767			76	.28
		14	3.70	1,000	55	.38		
		31	4.54	1,640	14	1.50		
		4	4.18	1,350	28	.75		
1946	Apr. May	26	3.23	758	6	3.50	77	.27
		6	4.07	1,340			29	.72
		8	3.94	1,240			40	.52
		13	3.90	1,210			41	.51
		17	4.20	1,450			23	.91
		25	4.83	1,970			6	3.50
	June	2	4.07	1,370			27	.78
		6	4.40	1,650			13	1.62
		14	3.76	1,140			47	.45
		20	3.47	938			65	.32
1947	Apr. May	29	3.78	1,100	8	2.62	50	.42
		7	4.54	1,690			10	2.10
		21	3.54	931			67	.31
	June	26	4.07	1,330			30	.70
		2	3.57	966			59	.36
		9	3.73	1,080			51	.41
1947 1948	Oct. May June	13	3.48	910	1	21.0	68	.31
		19	4.64	1,790			9	2.62
		13	3.23	746			90	.26
		28	5.34	2,530			1	21.0
		7	4.38	1,630			16	1.31
		11	4.32	1,570			20	1.05
		16	3.51	938			66	.32
		24	3.38	839			72	.29
Period 1929-48				1,669	Mean annual			



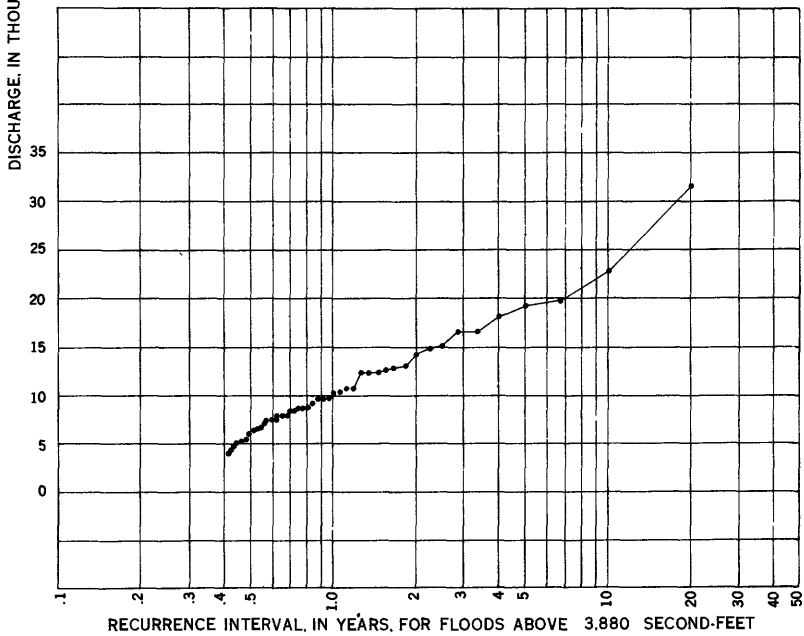
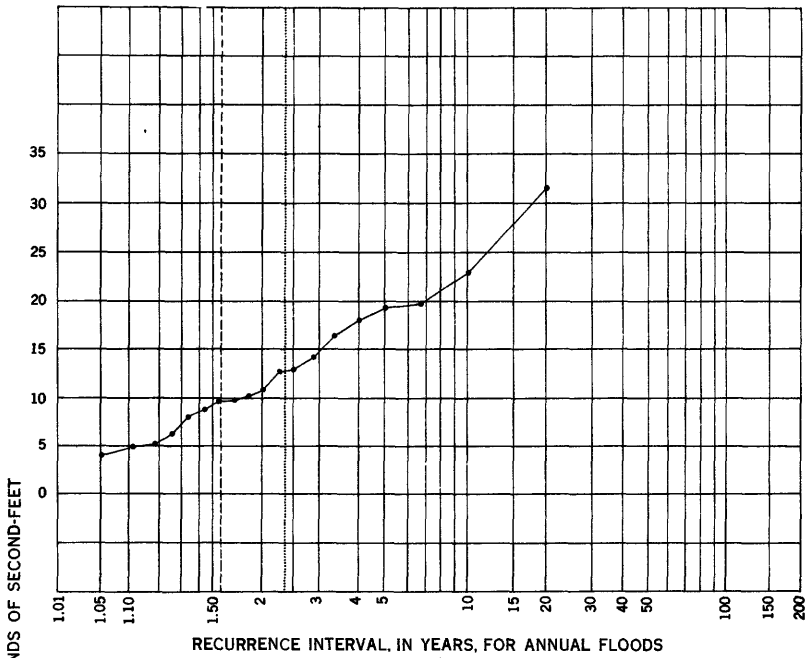
## PEND OREILLE RIVER BASIN

Clark Fork above Missoula, Mont.

Location.- Lat. 46°53', long. 113°56', 3 miles downstream from Blackfoot River and 3 miles east of Missoula.Drainage area.- 5,740 square miles.Records available.- March 1929 to September 1948.Gage.- Recording.Stage-discharge relation.- Defined by current-meter measurements below 26,000 second-feet.Maximum flood of record.- 31,500 second-feet May 23, 1948.Remarks.- Some regulation by power plant at Bonner. Several small diversions above station for irrigation. For frequency study, flood peaks affected by regulation are adjusted to their natural values. When annual peak is so affected, both unadjusted and adjusted values are listed, except latter figure is omitted when smaller than base flood.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1930	Apr.	28	6.54	8,200	14	1.43	25	0.80
		5	6.30	8,660				
		31	5.84	7,350			35	.57
1931	May	17	4.20	3,880	19	1.05	50	.40
		21	4.36	4,150				
1932	May	14	7.65	12,800	8	2.50	16	1.25
		14	7.40	12,200			12	1.67
		22	7.60	12,800			19	1.05
		June 17	6.75	10,300				
1933	Apr.	30	4.90	5,410	3	6.67	42	.48
		2	9.90	21,600			3	6.67
		5	9.40	19,700				
1934	Apr.	13	8.42	15,300	7	2.86	14	1.43
		14	7.40	12,300			10	2.00
		25	8.00	14,100			15	1.33
	May	9	7.40	12,300			32	.62
		8	5.80	7,790				
1935	May	24	6.50	9,710	12	1.68	21	.95
		25	6.74	10,300				
1936	Apr.	12	4.80	5,300	9	2.22	43	.46
		26	5.96	8,330			29	.69
	May	6	6.48	9,700			22	.91
		16	7.51	12,600			13	1.54
		2	6.06	8,600			27	.74
1937	May	9	5.85	7,790	18	1.11	31	.65
		5	5.80	7,790			46	.44
		29	4.68	4,940				
		June 18	4.23	4,020			49	.41
1938	May	3	5.96	7,540	4	5.00	33	.61
		29	9.85	19,100			4	5.00
		30	10.01	19,700				
	June	25	7.00	10,700			17	1.18
		July 4	6.45	9,060			24	.83
1939	Mar.	22	4.30	4,260	10	2.00	48	.42
		5	7.10	11,000			18	1.11
		5	6.95	10,700				
	June	18	6.06	8,380			28	.72
		20	4.50	4,680			47	.43
1940	May	13	5.17	6,140	16	1.25	40	.50
1941	June	6	4.89	5,400	17	1.18	44	.46
		6	4.80	5,170				
1942	Apr.	23	5.10	6,000	6	3.33	41	.49
		27	8.80	16,400			7	2.86
		9	7.72	13,000			11	1.81
		12	9.58	19,100				

Clark Fork above Missoula, Mont., 1930-48



## PEND OREILLE RIVER BASIN

Clark Fork above Missoula, Mont.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1943	Mar. Apr.	28	4.70	5,110	5	4.00	45	0.44
		3	5.28	6,470			38	.53
		20	9.50	18,700			8	2.50
	May June	21	8.37	15,100			6	3.33
		31	8.82	16,400			5	4.00
		20	9.27	18,000				
1944	May	20	5.99	8,230	15	1.33	30	.68
		20	h5.90	h7,970			37	.54
	June	18	5.40	6,710			34	.59
		29	5.66	7,460				
1945	Apr. June	18	5.30	6,330	13	1.54	39	.51
		7	6.75	8,860			23	.87
		7	h6.67	h9,590				
1946	May	7	5.57	7,050	11	1.82	36	.56
		29	6.84	10,100			20	1.00
1947	May	9	11.10	24,200	2	10.0	2	10.0
		10	10.73	22,800			9	2.22
		10	8.56	14,800				
1948	Apr. May	24	6.30	8,630	1	20.0	26	.77
		23	13.07	31,500			1	20.0
Period 1930-48				12,830	Mean annual			

g Result of regulation; not used in frequency study.

h Adjusted for storage.

j Partly regulated.

Clark Fork below Missoula, Mont.

Location.- Lat. 46°52', long. 114°07', 2 miles downstream from Bitterroot River and 6 miles west of Missoula.

Drainage area.- 8,690 square miles.

Records available.- October 1929 to September 1948 (1934 fragmentary).

Gage.- Recording.

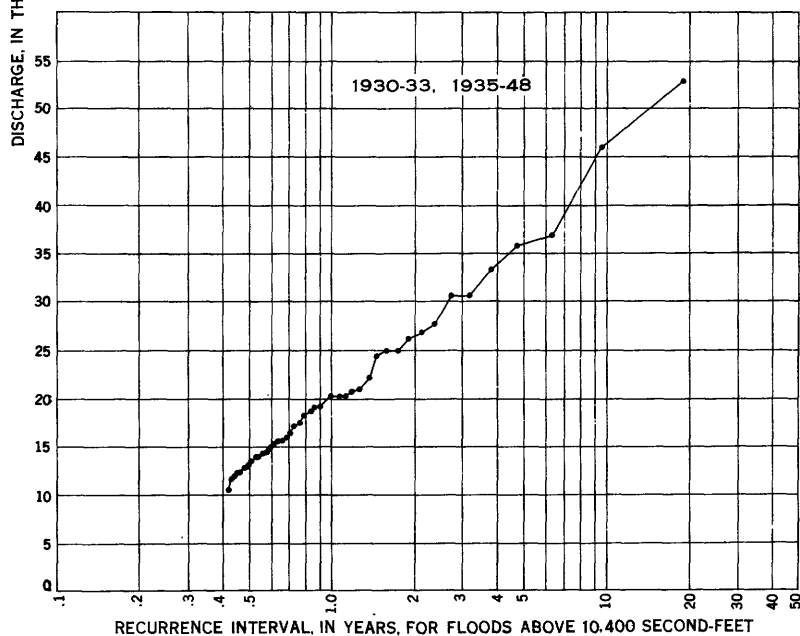
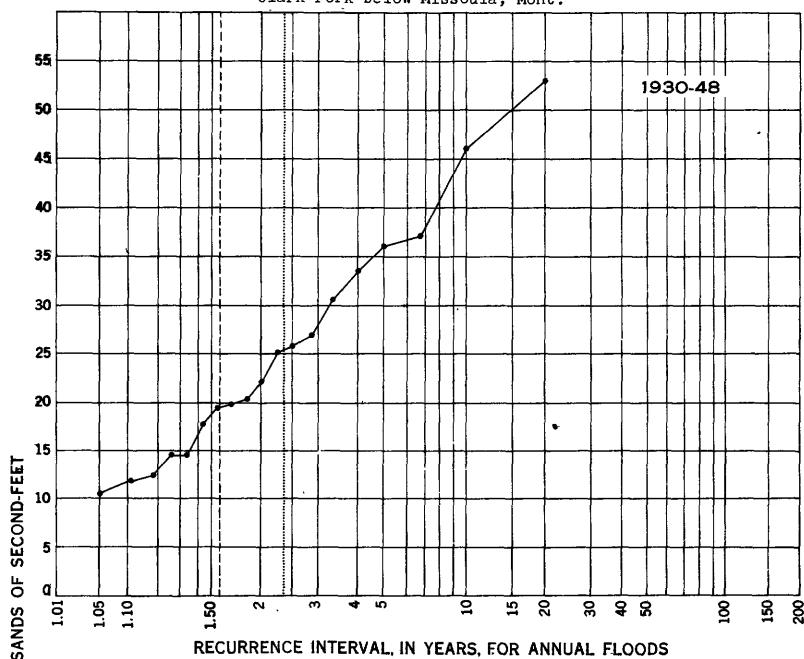
Stage-discharge relation.- Defined by current-meter measurements below 46,900 second-feet.

Maximum flood of record.- 52,800 second-feet May 23, 1948.

Remarks.- Some regulation by power plant at Bonner. Many diversions above station for irrigation.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1930	Apr. May	26	6.32	17,500	14	1.43	25	0.76
		22	5.50	13,900			35	.54
		31	6.20	17,100			26	.73
1931	May	18	5.08	12,200	17	1.18	42	.45
1932	May	15	7.97	24,400			13	1.46
		23	8.12	25,000	9	2.22	11	1.73
		17	7.27	21,000			15	1.27
1933	Apr. June	29	5.15	12,400			41	.46
		11	10.14	36,800	3	6.67	3	6.33
1934	Apr. May June	15	7.21	21,300			-	-
		26	8.00	25,700			-	-
		9	7.44	22,400	8	2.50	-	-
		8	5.96	15,200			-	-
1935	May	25	6.80	20,200	11	1.82	17	1.12
1936	Apr. May June	26	6.57	18,200			24	.79
		6	7.02	20,200			18	1.06
		16	8.54	26,700			9	2.11
		2	7.09	20,700	7	2.86	16	1.19
		9	6.22	16,300			27	.70
1937	May	27	5.09	11,700	18	1.11	43	.44

Clark Fork below Missoula, Mont.



## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

PEND OREILLE RIVER BASIN  
Clark Fork below Missoula, Mont.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1938	Apr.	20	5.42	12,800	4	5.00	39	0.49
		May	2	6.12			28	.68
	30	10.00	35,700	4			4.75	
	June	19	6.68	18,700			23	.83
		25	6.99	20,200			19	1.00
1939	May	5	7.29	22,000	10	2.00	14	1.36
		18	6.72	19,100			21	.90
		31	5.90	15,600			29	.66
1940	May	13	5.56	14,200	16	1.25	34	.56
1941	June	2	4.61	10,400	19	1.05	45	.42
1942	Apr.	23	4.83	11,500	6	3.33	44	.43
	May	27	8.96	30,500			6	3.17
	June	10	7.87	25,000			12	1.58
1943	Mar.	30	5.79	15,200	5	4.00	31	.61
	Apr.	20	8.42	27,500			8	2.38
	June	1	9.00	30,500			7	2.71
		20	9.47	33,200			5	3.80
1944	May	20	5.36	13,500	15	1.33	37	.51
	June	2	5.19	12,700			40	.48
		18	5.58	14,400			33	.58
1945	May	7	5.33	13,100	13	1.54	38	.50
	June	2	6.66	19,100			22	.86
		23	5.91	15,600			30	.63
1946	May	6	5.37	13,800	12	1.67	36	.53
		29	6.72	19,700			20	.95
1947	May	10	11.18	45,900	2	10.0	2	9.50
	June	10	8.23	26,000			10	1.90
1948	Apr.	23	5.87	14,800	1	20.0	32	.59
	May	23	12.08	52,800			1	19.0
Period 1930-1948				24,930	Mean annual			

Clark Fork at St. Regis, Mont.

Location.- Lat. 47°18', long. 115°05', at St. Regis and half a mile downstream from St. Regis River.

Drainage area.- 10,500 square miles.

Records available.- October 1910 to September 1923, February 1929 to September 1948.

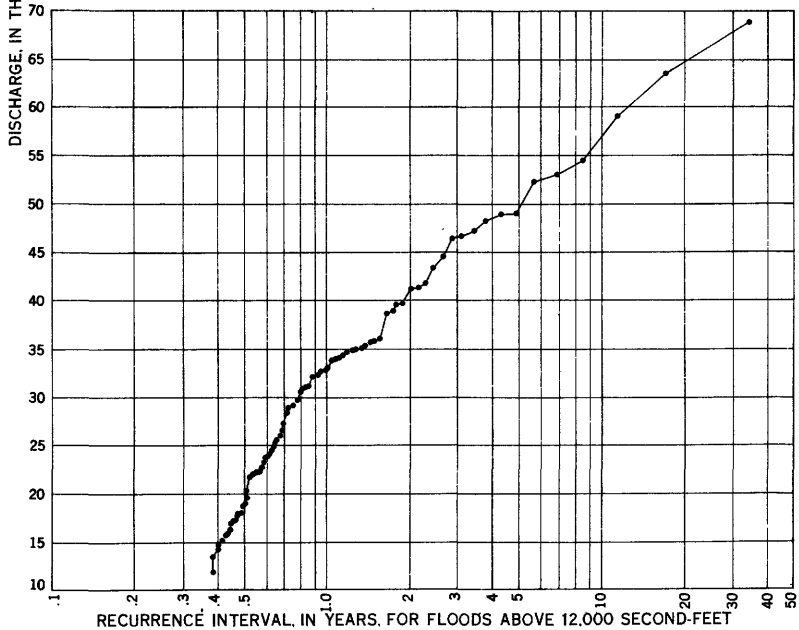
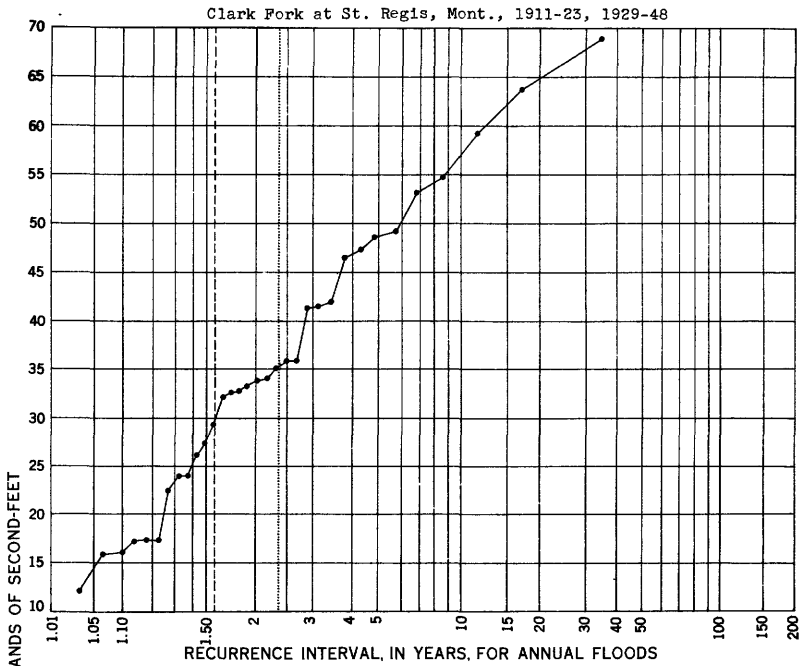
Gage.- Non-recording gage read once daily prior to Nov. 29, 1933, recording gage thereafter.

Stage-discharge relation.- Defined by current-meter measurements below 67,400 second-feet.

Maximum flood of record.- 68,900 second-feet May 24, 1948.

Remarks.- Some regulation. Many diversions above station. Gage heights for period when non-recording gage was used are from graphs based on gage readings.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1911	May	8	11.5	23,400	17	2.00	59	0.58
	June	14	13.9	33,800			33	1.03
1912	May	23	15.1	39,500	11	3.09	19	1.79
	June	12	15.5	41,400			16	2.12
1913	May	4	14.0	34,300	2	17.0	30	1.13
		13	14.1	34,800			28	1.21
		30	19.2	63,500			2	17.0
1914	May	10	13.4	31,200	15	2.27	40	.85
		15	14.2	35,000			26	1.31
	June	15	12.4	26,700			50	.68
		23	10.0	17,300			74	.46



PEND OREILLE RIVER BASIN  
 Clark Fork at St. Regis, Mont.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1915	June	21	10.0	17,300	28	1.22	75	0.45
1916	Mar.	22	9.65	15,900	5	6.80	80	.42
	Apr.	27	13.1	29,800			44	.77
	May	8	14.4	36,000			22	1.54
		19	15.1	39,600			18	1.89
	June	20	17.5	53,000			5	6.80
	July	1	16.8	48,900			8	4.25
		18	14.0	34,000			32	1.06
1917	Apr.	27	9.2	14,500	3	11.3	85	.40
	May	29	18.5	59,100			3	11.3
	June	11	16.4	46,700			11	3.09
		19	17.4	52,400			6	5.67
1918	Apr.	14	11.25	21,800	7	4.86	65	.52
		25	14.2	35,000			27	1.26
	May	2	16.0	44,500			13	2.62
		7	14.9	38,500			21	1.62
	June	2	13.0	29,300			45	.75
		14	16.7	48,400			9	3.78
		27	13.4	31,200			41	.83
1919	Apr.	29	10.4	18,800	22	1.55	70	.49
	May	31	13.0	29,300			46	.74
1920	May	18	13.6	32,100	21	1.62	38	.90
	June	17	13.6	32,100			39	.87
1921	May	28	15.5	41,800	10	3.40	15	2.27
1922	May	8	9.6	15,900	8	4.30	81	.42
		27	15.8	43,400			14	2.43
	June	8	16.5	47,200			10	3.40
1923	Apr.	20	9.0	13,800	18	1.89	89	.38
		29	9.2	14,500			86	.40
	May	26	13.3	30,700			43	.79
	June	12	13.8	33,100			34	1.00
1929	May	26	13.7	32,600	20	1.70	36	.94
	June	11	11.8	24,200			56	.61
1930	Apr.	26	11.30	22,200	27	1.26	62	.55
	June	1	10.5	19,200			68	.50
1931	May	17	9.55	15,900	32	1.06	82	.42
1932	May	15	13.60	32,300	19	1.79	37	.92
		23	13.70	32,700			35	.97
	June	17	12.1	25,400			53	.64
1933	Apr.	29	10.20	18,000	6	5.67	73	.47
	June	11	16.85	49,000			7	4.86
	Dec.	23	14.10	34,700			29	1.17
1934	Mar.	31	11.43	22,400	14	2.43	61	.56
	Apr.	26	14.27	35,700			24	1.42
	May	9	12.92	29,000			47	.72
	June	9	10.39	18,200			71	.48
1935	May	25	12.36	27,400	23	1.48	49	.69
1936	Apr.	26	12.19	24,800	16	2.12	54	.63
	May	7	12.37	25,700			52	.65
		17	14.16	34,000			31	1.10
	June	3	12.08	24,400			55	.62
1937	May	28	10.06	17,100	30	1.13	77	.44
1938	Apr.	18	11.01	20,400	9	3.78	66	.51
	May	3	11.35	22,100			64	.53
		31	16.00	46,400			12	2.83
1939	May	5	12.81	26,100	24	1.42	51	.67
		19	11.92	22,600			60	.57
1940	May	13	10.38	17,200	29	1.17	76	.45
1941	June	3	8.82	12,000	33	1.03	90	.38

PEND OREILLE RIVER BASIN  
Clark Fork at St. Regis, Mont.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1942	Apr. May June	23	9.64	14,900	13	2.62	84	0.40
		28	14.22	35,800			23	1.48
		11	12.84	28,500			48	.71
1943	Mar. Apr. June	30	10.00	16,400	12	2.83	78	.44
		21	14.47	35,300			25	1.36
		1	15.23	38,800			20	1.70
		21	15.69	41,300			17	2.00
1944	May June	21	9.84	15,100	31	1.10	83	.41
		2	9.57	14,300			87	.39
		18	9.94	16,000			79	.43
1945	May June	8	10.83	18,900	25	1.36	69	.49
		2	12.05	23,900			57	.60
		23	10.60	18,100			72	.47
1946	May  Dec.	7	11.02	19,700	26	1.31	67	.51
		30	12.03	23,900			58	.59
		15	9.65	14,300			88	.39
1947	May June	10	17.91	54,600	4	8.50	4	8.50
		11	13.58	31,000			42	.81
1948	Apr. May	24	11.63	22,200	1	34.0	63	.54
		24	19.95	68,900			1	34.0
Period 1911-23, 1929-48				35,380	Mean annual			



## PEND OREILLE RIVER BASIN

Clark Fork near Plains, Mont.

Location.- Lat. 47°28', long. 114°51', 2 miles upstream from Plains and 6 miles downstream from Flathead River.

Drainage area.- 19,900 square miles.

Records available.- October 1910 to September 1948 (1934 partly estimated).

Gage.- Recording. Datum of gage is 2,449.34 feet above mean sea level, datum of 1929.

Stage-discharge relation.- Defined by current-meter measurements below 128,000 second-feet.

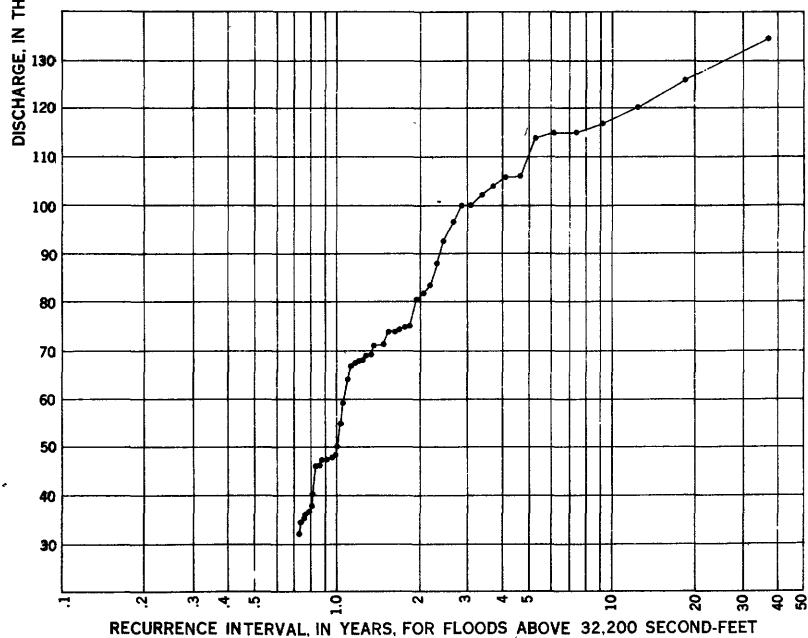
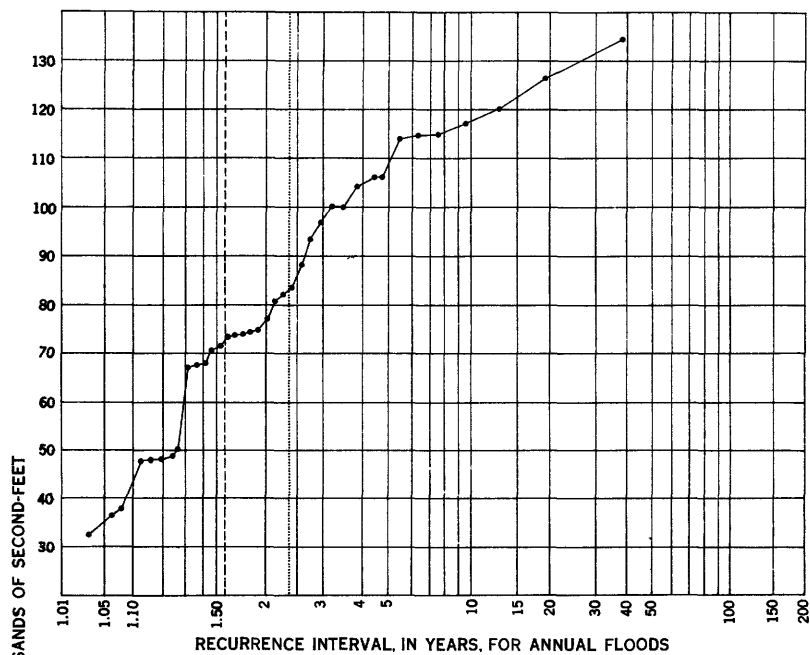
Maximum flood of record.- 134,000 second-feet June 5, 1948.

Remarks.- Flow somewhat affected by natural storage in Flathead Lake. Some regulation by Flathead Lake since the completion of Kerr Dam Apr. 12, 1938; usable capacity, 1,219,000 acre-feet. Many diversions above station for irrigation.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1912	June	11	14.0	74,500	21	1.81	21	1.76
1913	June	5	17.94	115,000	5	7.60	5	7.40
1914	May	25	13.1	67,000	29	1.31	33	1.12
1915	June	7	9.76	37,900	35	1.08	46	.80
1916	May	9		67,400			31	1.19
	July	2	17.9	115,000	6	6.34	6	6.17
1917	May	30	16.6	102,000			11	3.36
	June	20	17.0	106,000	8	4.75	8	4.62
1918	May	7	13.3	69,100			28	1.32
	June	16	16.45	100,000	11	3.45	12	3.08
1919	May	31	13.8	73,800	23	1.65	23	1.61
1920	June	18	13.8	73,800	24	1.58	24	1.54
1921	May	28	16.0	100,000	12	3.17	13	2.85
1922	June	9	17.25	114,000	7	5.43	7	5.28
1923	June	14	15.5	96,500	13	2.92	14	2.64
1924	May	20	14.0	80,300	18	2.11	19	1.95
1925	May	22	16.55	106,000	9	4.22	9	4.11
1926	May	6	11.0	47,800	32	1.19	39	.95
1927	June	14	17.6	117,000	4	9.50	4	9.25
1928	May	28	18.41	126,000	2	19.0	2	18.5
1929	June	11	12.95	67,300	28	1.36	32	1.16
1930	June	1	10.76	47,300	33	1.15	41	.90
1931	May	19	10.85	47,300	34	1.12	40	.92
1932	May	24	14.53	83,600	16	2.37	17	2.18
1933	June	17	18.00	120,000	3	12.7	3	12.3
1934	May	10	14.01	76,800	19	2.00	-	-
1935	June	3	13.27	71,200	25	1.52	25	1.48
1936	May	17	14.38	81,800	17	2.24	18	2.06
1937	May	30	11.05	50,000	30	1.27	37	1.00
1938	May	31	14.98	88,000	15	2.53	16	2.31
1939	May	20	13.07	68,000	27	1.41	30	1.23
	June	20	9.97	40,500			45	.82
1940	May	27	10.88	48,100	31	1.23	38	.97
1941	June	6	8.91	32,200	37	1.03	51	.73
1942	May	29	13.14	69,000			29	1.28
	June	11	13.65	74,000	22	1.73	22	1.68
		16	11.62	54,900			36	1.03
	July	1	10.75	47,300			42	.88
1943	Apr.	22	12.57	64,000			34	1.09
	June	22	15.30	92,500	14	2.71	15	2.47
1944	June	6	9.16	35,400			49	.76
		13	9.27	36,200	36	1.06	48	.77
1945	June	4	13.66	74,900	20	1.90	20	1.85
		24	12.08	59,200			35	1.06
1946	May	30	13.33	70,900	26	1.46	27	1.37
	June	26	10.58	46,200			43	.86
	July	5	9.12	34,700			50	.74
1947	May	11	16.41	104,000	10	3.80	10	3.70
	June	30	10.60	46,200			44	.84
1948	Oct.	23	9.40	36,900			47	.79
	June	5	19.17	134,000	1	38.0	1	37.0
Period 1912-48				81,590	Mean annual			

k Estimated.

Clark Fork near Plains, Mont., 1912-48



## PEND OREILLE RIVER BASIN

Pend Oreille River below Z Canyon, near Metaline Falls, Wash.

(Formerly called Clark Fork)

(International gaging station)

Location.- Lat. 48°59', long. 117°21', three-quarters of a mile downstream from Z Canyon, 1½ miles south of international boundary, 5 miles downstream from Slate Creek, and 10 miles downstream from Metaline Falls. Prior to Oct. 1, 1928, at sites at Metaline Falls and Newport, Wash., and Priest River, Idaho.

Drainage area.- 25,200 square miles at sites below Z Canyon and at Metaline Falls; 24,200 square miles at Newport and Priest River.

Records available.- June 1903 to April 1905 at Priest River, Idaho; May 1905 to September 1912 at Newport, Wash., except during most of the winter months; October 1912 to September 1928 at Metaline Falls; October 1928 to September 1948 below Z Canyon, near Metaline Falls.

Gage.- Non-recording gage read once daily prior to Oct. 1, 1928; recording gage thereafter. Datum of Z Canyon gage is 1,721.80 feet above mean sea level, datum of 1929 (levels by Corps of Engineers).

Stage-discharge relation.- Defined by current-meter measurements.

Maximum flood of record.- 171,300 second-feet June 13, 1948.

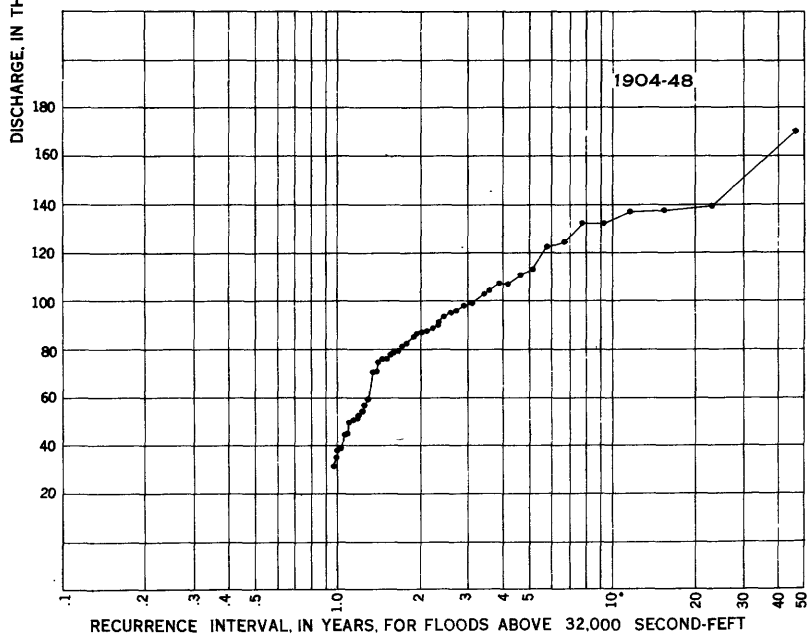
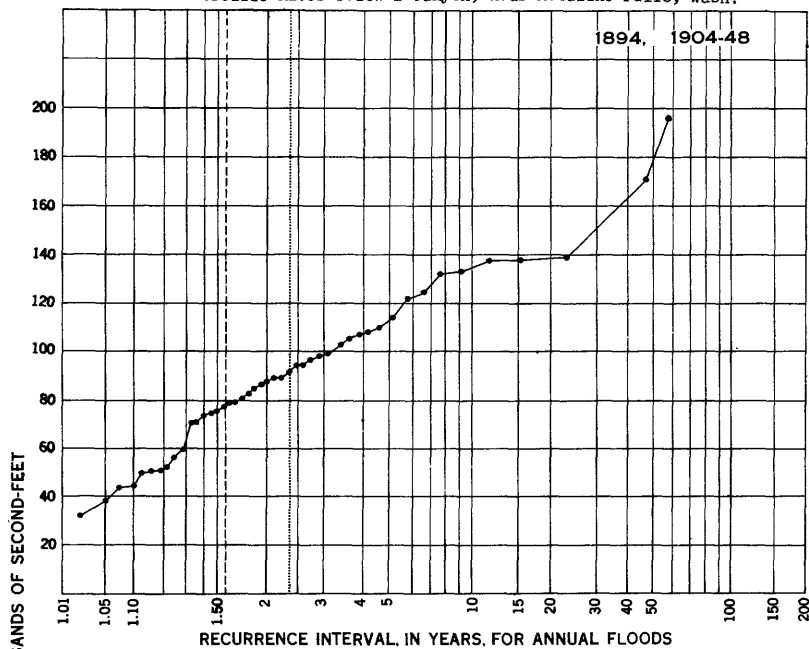
Historical data.- Maximum discharge known, 195,000 second feet (revised), estimated, in June 1894.

Remarks.- Peak daily discharges are listed throughout. Several small diversions for irrigation from upper tributaries have negligible effect on flood flows. Flow affected by natural storage in Pend Oreille and Flathead Lakes. Slight regulation by Flathead Lake since 1938; usable capacity, 1,219,000 acre-feet. This station is one of the international gaging stations maintained by the United States under agreement with Canada.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1894	June			195,000	1	56.0		
1904	June	8	56.40	88,200	22	2.09	22	2.09
1905	June	17	8.8	50,800	40	1.15	41	1.12
1906	June	10	7.5	43,800	43	1.07	44	1.05
1907	June	15	16.7	95,200	18	2.56	18	2.56
1908	June	18	21.7	124,000	7	6.57	7	6.57
1909	June	25	34.85	104,000	13	3.54	13	3.54
1910	May	15	29.15	75,500	32	1.44	32	1.44
1911	June	21	29.55	77,400	30	1.53	30	1.53
1912	June	16	16.0	89,000	21	2.19	21	2.19
1913	June	16	41.2	139,000	2	23.0	2	23.0
1914	June	1	28.7	70,100	35	1.32	35	1.32
1915	May	31	19.8	44,000	42	1.10	43	1.07
1916	July	9	40.02	133,000	5	9.20	5	9.20
1917	June	25	36.2	122,000	8	5.75	8	5.75
1918	Jan.	6	16.4	38,500			45	1.02
	June	24	31.55	99,100	15	3.07	15	3.07
1919	June	5	27.4	79,100	29	1.59	29	1.59
1920	June	25	28.00	82,600	26	1.77	26	1.77
1921	June	14	34.0	111,000	10	4.60	10	4.60
1922	June	15	33.00	107,000	11	4.18	11	4.18
1923	June	17	29.96	91,900	20	2.30	20	2.30
1924	May	28	27.30	81,000	27	1.70	27	1.70
1925	May	30	34.03	114,000	9	5.11	9	5.11
1926	May	11	19.91	50,400	41	1.12	42	1.10
1927	June	23	37.65	133,000	6	7.67	6	7.67
	Dec.	7	14.90	35,600			47	.98
1928	June	4	37.88	137,000	3	15.3	3	15.3
1929	June	19	32.27	74,500	33	1.39	33	1.39
1930	June	7	25.22	50,900	39	1.18	40	1.15
1931	June	1	25.39	51,500	38	1.21	39	1.18
1932	May	28	40.86	98,000	16	2.88	16	2.88
1933	June	22	53.56	137,000	4	11.5	4	11.5
	Dec.	29	26.20	53,700			38	1.21
1934	May	14	39.45	94,400	19	2.42	19	2.42
1935	June	12	36.70	85,500	25	1.84	25	1.84
1936	May	22	37.22	87,200	24	1.92	24	1.92
1937	June	8	28.21	59,900	36	1.28	36	1.28
1938	June	10	40.05	96,500	17	2.70	17	2.70
1939	May	26	33.73	76,400	31	1.48	31	1.48
1940	May	31	27.14	56,600	37	1.24	37	1.24
1941	June	13	19.04	32,000	45	1.02	46	.96
1942	June	14	31.70	70,300	34	1.35	34	1.35
1943	June	28	42.0	103,000	14	3.38	14	3.38
1944	June	20	20.71	38,100	44	1.05	46	1.00
1945	June	11	34.78	79,500	28	1.64	28	1.64
1946	June	8	37.44	88,000	23	2.00	23	2.00
1947	May	18	43.52	107,000	12	3.83	12	3.83
1948	June	13	60.20	ml71,100	1	46.0	1	46.0
Period 1904-48				88,880	Mean annual			

m Provisional, subject to revision.

Pend Oreille River below Z Canyon, near Metaline Falls, Wash.



## PEND OREILLE RIVER BASIN

Flathead River near Columbia Falls, Mont.

(Formerly published as North Fork Flathead River near Columbia Falls)

Location.- Lat. 48°29', long. 114°05', at Potter Ranch, three-quarters of a mile upstream from Middle Fork and 10 miles northeast of Columbia Falls. Records for period 1910-17 at site 1,000 feet downstream at different datum.

Drainage area.- 1,620 square miles.

Records available.- September 1910 to September 1917, April 1929 to September 1948 (1930, 1931, 1933-36 fragmentary or partly estimated).

Gage.- Non-recording gage read twice daily prior to May 1, 1930, recording gage thereafter.

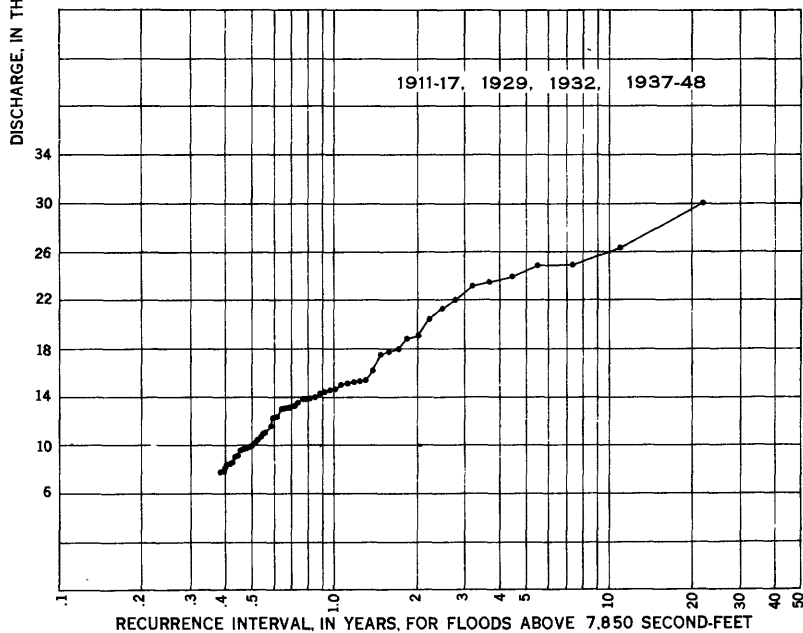
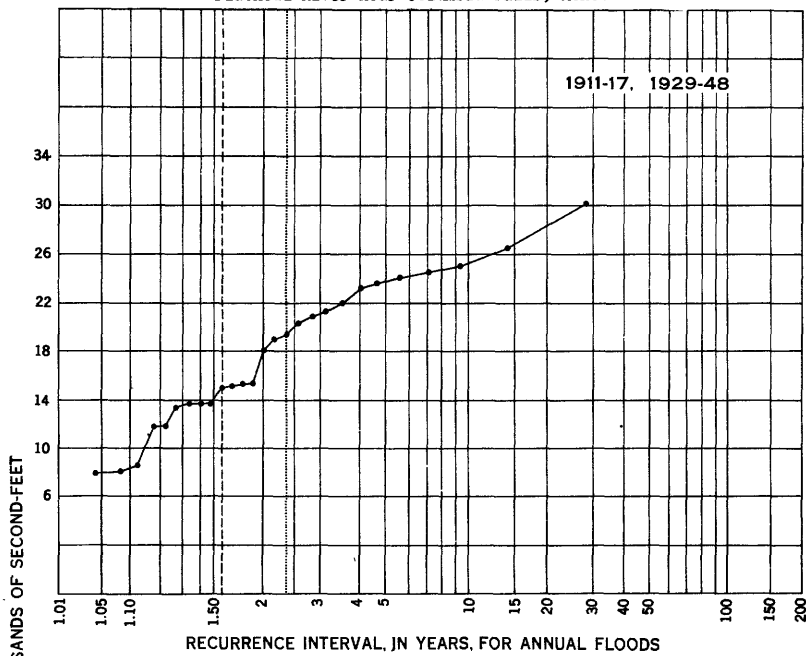
Stage-discharge relation.- Defined by current-meter measurements below 23,400 second-feet.

Maximum flood of record.- 30,100 second-feet June 20, 1916.

Remarks.- No diversion or regulation. Gage heights for period when non-recording gage was used are from graphs based on gage readings.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1911	May	6	6.15	10,500			42	0.52
		17	5.9	9,600			49	.45
	June	14	7.20	15,100	17	1.65	21	1.05
1912	May	17	6.45	11,700	24	1.17	38	.58
		13	5.6	8,540			53	.42
1913	May	12	5.4	7,900	7	4.00	57	.39
		2	8.7	23,200			7	3.14
1914	May	4	5.8	9,220			50	.44
		25	6.6	12,400			37	.59
		4	6.8	13,300		22	31	.71
		18	5.6	8,540			54	.41
1915	June	27	5.6	8,540	25	1.12	55	.40
1916	May	7	6.8	13,300	1	28.0	32	.69
		20	9.9	30,100			1	22.0
1917	May	16	7.9	18,800			12	1.83
		26	7.7	17,600			15	1.47
		10	9.0	24,900		3	3	7.33
		17	9.0	24,900			4	5.50
1929	May	15	7.4	9,900			45	.49
		24	10.2	20,300			10	2.20
	June	3	9.0	15,400	11	2.55	17	1.29
1930	May	31	7.96	11,800	23	1.22	-	-
1931	May	17	8.93	15,000	18	1.56	-	-
1932	May	14	9.93	19,000	9	3.11	11	2.00
		23	10.35	21,200			9	2.45
		2	9.59	17,800			14	1.57
		15	9.24	16,200			16	1.38
1933	June	17	11.14	24,400	4	7.00	-	-
1934	Apr.	26	9.95	19,400	12	2.33	-	-
1935	May	24	10.34	20,800	10	2.80	-	-
1936	May	16	9.86	19,000	13	2.15	-	-
1937	May	5	7.86	11,200	19	1.47	39	.56
		28	8.74	13,900			27	.81
		14	7.80	10,800			41	.54
1938	Apr.	19	8.60	13,600	5	5.60	30	.73
		2	8.50	13,200			34	.65
		28	10.87	24,000			5	4.40
		17	8.75	14,700			22	1.00
1939	Apr.	30	8.91	13,900	20	1.40	28	.78
		17	8.68	13,200			35	.63
		30	7.55	9,900			46	.48

## Flathead River near Columbia Falls, Mont.



PEND OREILLE RIVER BASIN  
Flathead River near Columbia Falls, Mont.---Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1940	May	12	8.57	13,900	21	1.33	29	0.76
		25	8.12	12,500			36	.61
1941	May	3	6.71	8,010	26	1.08	56	.39
1942	Apr.	23	7.30	9,800	14	2.00	47	.47
		11	7.70	11,100			40	.55
	May	27	9.57	18,000			13	1.69
		7	8.92	15,300			19	1.16
		29	7.44	10,100			44	.50
1943	Apr.	20	8.74	14,500	16	1.75	24	.92
	May	28	8.87	15,300			20	1.10
	June	19	8.90	14,300			25	.88
1944	May	17	6.82	7,850	27	1.04	58	.38
1945	May	6	7.64	10,200	15	1.87	43	.51
		2	9.19	15,400			18	1.22
		June	22	7.12			8,680	52
1946	May	7	9.00	14,700	8	3.50	23	.96
		29	10.79	22,000			8	2.75
1947	Apr.	30	8.62	13,300	6	4.67	33	.67
		10	11.08	23,500			6	3.67
		May	27	8.81			14,000	26
1947	Oct.	20	7.58	9,690	2	14.0	48	.46
1948	Apr.	30	7.40	9,120			51	.43
		May	24	11.84			26,400	2
Period 1911-17, 1929-48				17,810	Mean annual			

Flathead River at Columbia Falls, Mont.

Location.- Lat. 48°22', long. 114°11', 200 feet downstream from highway bridge at Columbia Falls and 5 miles downstream from South Fork.

Drainage area.- 4,440 square miles.

Records available.- May 1922 to September 1923 (fragmentary), June 1928 to September 1948.

Gage.- Non-recording gage read once daily prior to Nov. 12, 1928, recording gage thereafter. Datum of gage is 2,978.00 feet above mean sea level, datum of 1929 (levels by Corps of Engineers).

Stage-discharge relation.- Defined by current-meter measurements below 83,400 second-feet.

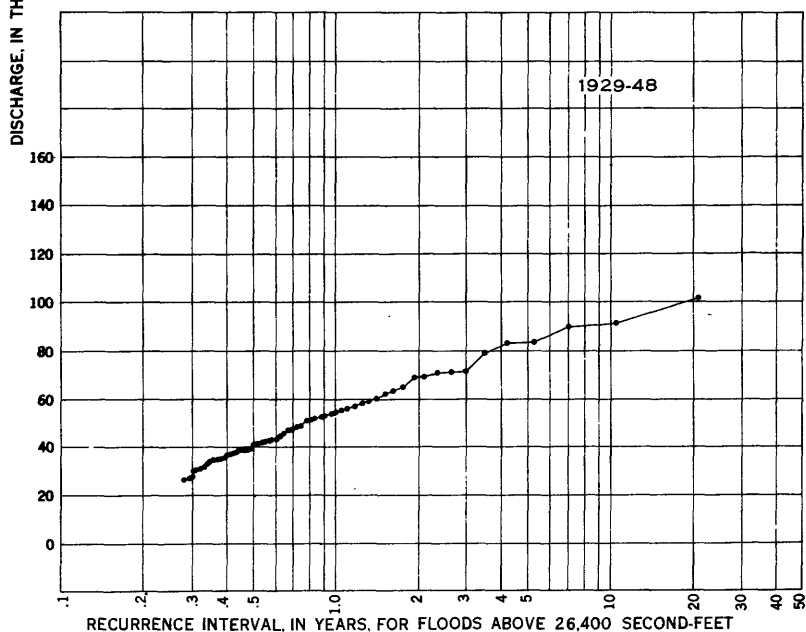
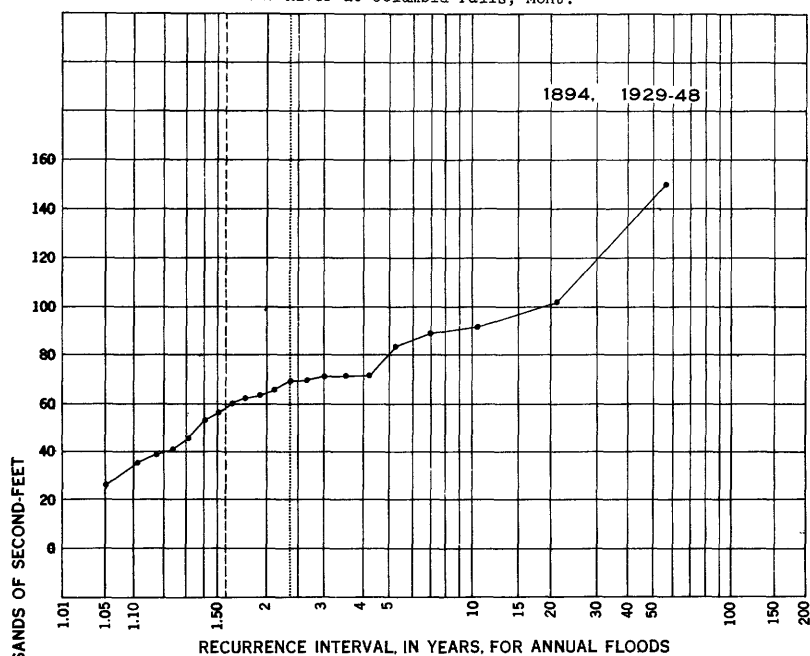
Maximum flood of record.- 102,000 second-feet May 23, 1948.

Historical data.- Maximum stage known, 22.7 feet in June 1894, from floodmarks (discharge, 150,000 second-feet, from rating curve extended above 83,400 second-feet by logarithmic plotting).

Remarks.- No diversion or regulation. Major shift in stage-discharge relation in 1933.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1894	June		22.7	150,000	1	56.0		
1929	May	14	10.54	36,600	8	2.62	53	0.40
		24	14.44	69,700			10	2.10
	June	2	12.00	48,200			29	.72
		9	11.37	43,400			36	.58
1930	Apr.	15	9.56	30,600	18	1.17	67	.31
		25	10.40	35,900			54	.39
	May	4	10.28	35,200			57	.37
		21	9.80	31,800			63	.33
		31	10.80	38,800			47	.45
1931	May	7	10.80	38,800	12	1.75	48	.44
		16	13.60	62,300			14	1.50
	June	26	9.97	33,200			62	.34
		2	9.50	30,000			69	.30
1932	May	14	15.36	79,300	3	7.00	6	3.50
		22	16.48	89,800			3	7.00
	June	2	12.50	52,400			25	.84
		15	12.66	54,100			22	.96

Flathead River at Columbia Falls, Mont.





PEND OREILLE RIVER BASIN  
 Flathead River at Columbia Falls, Mont.- Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1933	Apr. June	29	11.65	42,600	2	10.5	37	0.57
		10	16.70	83,500			5	4.20
		16	17.63	91,200			2	10.5
1934	Apr.	14	10.89	37,700	13	1.62	49	.43
		25	13.92	60,200			15	1.40
	May	8	13.71	58,600			17	1.24
		17	13.10	53,900			23	.91
		28	12.32	47,700			32	.66
	June	8	9.70	30,200			68	.31
1935	May	6	9.67	31,000	7	3.00	66	.32
		24	15.28	71,000			9	2.33
1936	Apr. May	20	11.00	39,100	5	4.20	43	.49
		5	12.76	51,800			27	.78
		15	15.40	71,800			7	3.00
1937	June	1	12.78	51,800	16	1.31	26	.81
		5	10.85	37,700			50	.42
		28	11.99	46,000			33	.64
1938	May	3	11.04	39,100	6	3.50	44	.48
		17	10.68	37,100			51	.41
		19	13.94	59,900			16	1.31
		2	11.63	42,500			38	.55
		27	15.30	71,200			8	2.62
1939	June	17	10.56	35,600	10	2.10	55	.38
		23	10.32	33,700			60	.35
		30	14.63	65,600			12	1.75
1940	May	17	14.09	57,700	17	1.24	18	1.17
		30	11.77	41,900			40	.52
		4	9.20	26,900			73	.29
1941	May	12	11.67	41,300	20	1.05	42	.50
		25	11.26	38,900			46	.46
		14	9.06	26,400			74	.28
1942	Apr. May	22	10.39	33,500	14	1.50	61	.34
		11	10.14	31,700			64	.33
		27	13.94	56,300			19	1.10
1943	June	7	11.83	41,900	11	1.91	41	.51
		20	13.71	54,900			21	1.00
		28	13.90	56,300			20	1.05
1944	May	18	14.89	63,600	19	1.11	13	1.62
		20	10.91	34,700			58	.36
		31	9.52	27,000			72	.29
1945	May	6	12.10	42,200	15	1.40	39	.54
		11	11.31	37,100			52	.40
		1	13.64	52,700			24	.89
1946	June	22	11.04	35,300	9	2.33	56	.38
		20	10.77	34,100			59	.36
		27	11.57	39,000			45	.47
1947	May	6	12.54	45,000	4	5.25	34	.62
		29	15.68	69,500			11	1.91
		June	6	13.11			49,200	28
1948	Apr.	29	12.68	47,900	1	21.0	30	.70
		9	17.27	83,700			4	5.25
		27	12.74	47,900			31	.68
1949	May	10	12.13	43,800	1	21.0	35	.60
		23	9.30	27,200			71	.30
		30	10.06	31,700			65	.32
Period 1929-48	May	9	9.44	27,800	1	21.0	70	.30
		23	19.08	102,000			1	21.0
		Mean annual						

## PEND OREILLE RIVER BASIN

Flathead River near Polson, Mont.

Location.- Lat. 47°41', long. 114°15', half a mile downstream from Kerr Dam and 6 miles downstream from Polson. Prior to Oct. 1, 1941, at site 6 miles downstream.

Drainage area.- 6,990 square miles; 7,010 square miles at former site.

Records available.- July 1907 to September 1948.

Gage.- Non-recording gage read once daily prior to Nov. 24, 1928, recording gage thereafter. Datum of gage prior to Oct. 1, 1941, was 2,629.0 feet above mean sea level (from river-profile survey). Datum of gage since Oct. 1, 1941, is 2,693.7 feet above mean sea level (Somers datum).

Stage-discharge relation.- Defined by current-meter measurements below 71,200 second-feet.

Maximum flood of record.- 82,800 second-feet May 29, 1928.

Remarks.- Several small diversions from tributaries above Flathead Lake. Flow somewhat affected by natural storage in Flathead Lake prior to completion of Kerr Dam Apr. 12, 1938, which regulated flow thereafter. Usable capacity of Flathead Lake, 1,219,000 acre-feet. For frequency study, flood peaks affected by regulation (1940-42, 1945-47) are adjusted to their natural values. Both maximum recorded and maximum adjusted figures of discharge are listed for each year except 1941, when regulation was so pronounced that no adjusted value could be determined.

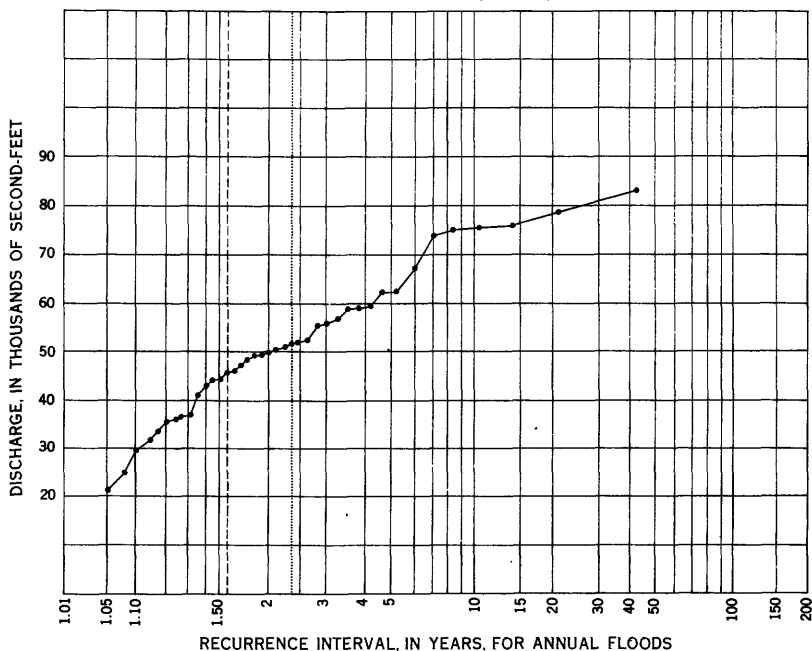
Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1908	June	13	14.6	62,100	8	5.25		
1909	June	22	13.75	58,800	11	3.82		
1910	May	15	11.55	42,800	30	1.40		
1911	June	20	11.9	44,200	28	1.50		
1912	June	15	-	k36,500	32	1.31		
1913	June	10	16.4	75,400	3	14.0		
1914	May	26	11.4	41,000	31	1.35		
1915	May	18	8.0	21,000	40	1.05		
1916	July	4	16.3	74,700	5	8.40		
1917	June	23	14.1	59,100	10	4.20		
1918	June	20	14.0	58,400	12	3.50		
1919	June	1	12.5	48,200	24	1.75		
1920	June	24	11.9	44,200	29	1.45		
1921	June	11	14.3	62,000	9	4.67		
1922	June	10	13.5	56,400	13	3.23		
1923	June	15	13.43	55,700	14	3.00		
1924	May	26	12.09	47,000	25	1.68		
1925	May	25	15.02	67,000	7	6.00		
1926	May	8	9.22	29,200	38	1.10		
1927	June	19	16.1	75,000	4	10.5		
1928	May	29	17.2	82,800	1	42.0		
1929	June	13	11.70	45,500	27	1.56		
1930	June	11	9.98	31,700	37	1.14		
1931	May	20	10.52	35,400	35	1.20		
1932	May	24	15.60	51,800	17	2.47		
1933	June	19	17.30	78,100	2	21.0		
1934	May	12	13.30	52,200	16	2.62		
1935	June	5	13.03	50,200	20	2.10		
1936	May	19	13.12	50,900	19	2.21		
1937	June	4	10.83	35,800	34	1.24		
1938	June	7	13.07	49,200	23	1.83		
1939	May	20	12.42	45,900	26	1.62		
1940	May	27	11.20	g38,400				
		28	h10.4	h33,300	36	1.17		
1941	June	4	8.56	g22,200				
1942	May	30	h13.1	h36,200	33	1.27		
	June	10	16.20	g53,500				
1943	June	24	15.52	49,300	22	1.91		
1944	June	6	10.57	24,500	39	1.08		
1945	June	3	17.04	g58,400				
		5	h15.90	h51,700	18	2.33		
1946	June	7	15.67	g50,500				
		8	h15.56	h49,900	21	2.00		
1947	May	15	16.80	g56,600				
		16	h16.62	h55,400	15	2.80		
1948	June	6	19.15	73,200	6	7.00		
Period 1908-40, 1942-48				51,040	Mean annual			

g Result of regulation; not used in frequency study.

h Adjusted for storage.

k Estimated.

Flathead River near Polson, Mont., 1906-48



Middle Fork Flathead River at Belton, Mont.

Location.- Lat. 48°30'00", long. 113°58'30", at Belton, half a mile upstream from highway bridge and 2 miles upstream from McDonald Creek.

Drainage area.- 950 square miles.

Records available.- October 1910 to September 1923 (1913-14 fragmentary), February 1929 to June 1933, August 1943 to September 1947. Annual peak only 1947-48.

Gage.- Non-recording gage read once daily.

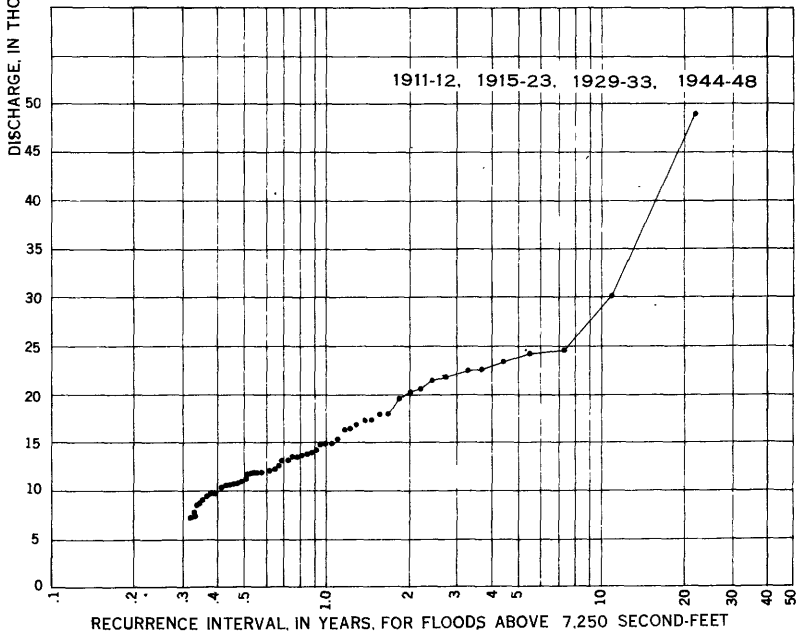
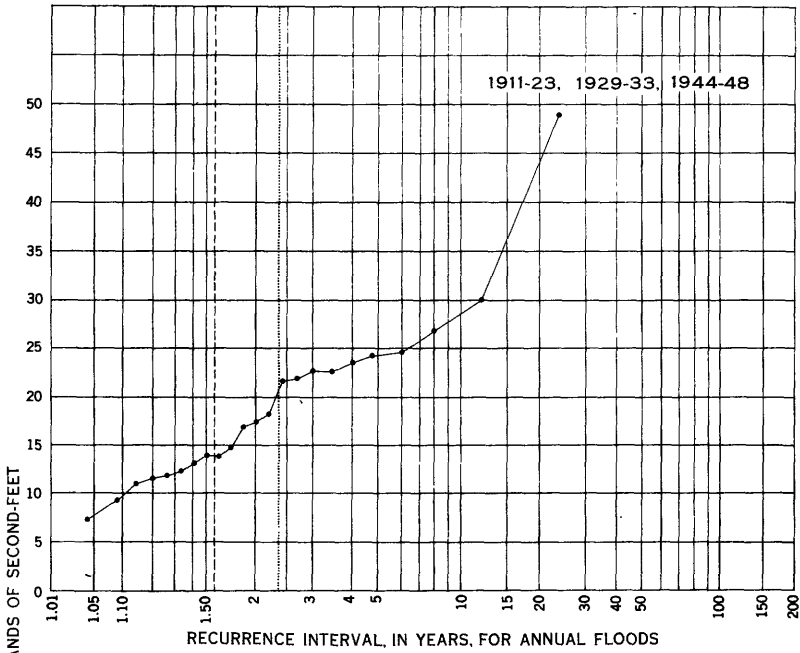
Stage-discharge relation.- Defined by current-meter measurements below 22,800 second-feet.

Maximum flood of record.- 49,000 second-feet June 21, 1916.

Remarks.- No diversion or regulation.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1911	Apr.	27	7.9	8,430	17	1.41	65	0.34
		6	9.9	13,000			31	.71
	June	17	8.8	10,500			52	.42
		3	9.9	13,000			32	.69
1912	May	14	9.1	11,200	18	1.33	43	.51
		16	9.5	12,200			34	.65
		27	8.9	10,700			48	.46
		27	14.2	26,900			-	-
1913	May	27	14.2	26,900	3	8.00	-	-
1914	May	17	9.2	11,500	20	1.20	-	-
1915	May	2	7.4	7,250	23	1.04	68	.32
1916	Apr.	28	8.4	9,540	1	24.0	57	.39
	May	7	10.9	16,200			19	1.16
		21	8.0	8,600			64	.34
	June	5	9.9	13,400			28	.79
		10	9.9	13,400			29	.76
		21	20.0	49,000			1	22.0
1917	May	15	12.7	21,800	9	2.67	8	2.75
		26	10.45	14,800			22	1.00
		9	11.3	17,400			15	1.47
		17	11.5	18,000			13	1.69

## Middle Fork Flathead River at Belton, Mont.



## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

PEND OREILLE RIVER BASIN  
Middle Fork Flathead River at Belton, Mont.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1918	May	4	11.0	16,500	7	3.43	18	1.22
		16	8.2	9,060			61	.36
		31	8.4	9,540			58	.38
	June	11	12.9	22,500			6	3.67
1919	May	2	8.1	8,830	16	1.50	62	.36
		28	10.0	13,600			27	.81
1920	May	18	9.3	11,800	19	1.26	40	.55
	June	9	8.9	10,800			46	.48
1921	May	11	10.1	13,900	10	2.40	25	.88
		27	12.6	21,500			9	2.44
		8	10.2	14,200			24	.92
1922	May	20	12.0	19,600	8	3.00	12	1.83
	June	5	12.9	22,500			7	3.14
1923	Apr.	29	7.5	7,470	13	1.85	67	.33
	May	9	9.4	12,000			36	.61
	June	26	11.1	16,800			17	1.29
		11	10.6	15,400			20	1.10
1929	May	14	9.1	11,900	12	2.00	38	.58
		24	10.7	17,300			16	1.38
	June	1	10.0	14,900	21	1.14	21	1.05
		7	8.5	10,000			54	.41
1930	Apr.	14	8.8	10,900			45	.49
	May	25	8.7	10,600			50	.44
		3	8.6	10,300			53	.42
	June	21	7.6	7,660			66	.33
		30	8.5	10,000			55	.40
1931	May	7	9.1	11,900	11	2.18	39	.56
		16	10.7	18,000			14	1.57
		25	8.0	8,630			63	.35
1932	May	14	11.5	20,200	5	4.80	11	2.00
		22	12.5	24,100			4	5.50
	June	2	8.9	11,200			44	.50
		15	9.05	11,600			42	.52
1933	Apr.	28	9.6	12,500	6	4.00	33	.67
	May	31	12.0	20,600			10	2.20
	June	16	12.7	23,400			5	4.40
1944	May	20	8.3	9,190	22	1.09	60	.37
1945	May	6	9.3	12,000	15	1.60	37	.59
		11	8.8	10,700			49	.45
	June	1	9.9	13,700			26	.85
		22	8.3	9,470			59	.37
1946	Apr.	20	8.3	9,610	14	1.71	56	.39
	May	26	8.7	10,600			51	.43
		15	9.2	11,800			41	.54
		18	9.3	12,100			35	.63
		28	10.3	14,800			25	.96
	June	6	8.8	10,800			47	.47
1947	Apr.	29	9.70	13,100	4	6.00	30	.73
	May	9	n13.00	24,500			3	7.33
1948	May	23	n14.3	30,000	2	12.0	2	11.0
Period 1911-23, 1929-33, 1944-48				18,970	Mean annual			

n From floodmarks.

## PEND OREILLE RIVER BASIN

South Fork Flathead River near Columbia Falls, Mont.

Location.- Lat. 48°22', long. 114°03', 2 miles upstream from mouth and 9 miles east of Columbia Falls. Prior to Aug. 29, 1928, at site 6,000 feet downstream at different datum.

Drainage area.- 1,640 square miles.

Records available.- September 1910 to September 1916 (fragmentary), April 1923 to September 1948 (1925-26 fragmentary).

Gage.- Non-recording gage prior to Apr. 13, 1923, recording gage thereafter. Datum of gage since Aug. 29, 1928, is 3,031.3 feet above mean sea level, datum of 1929 (Corps of Engineers bench mark).

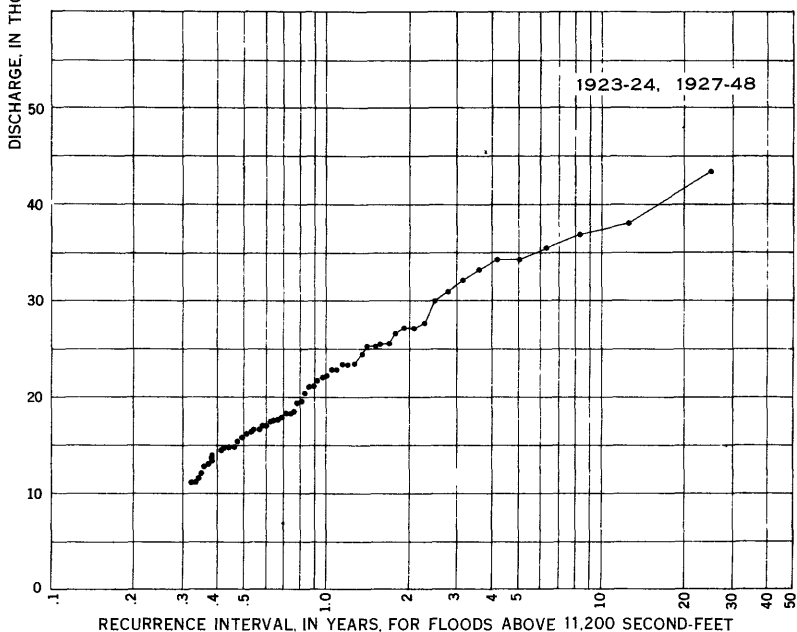
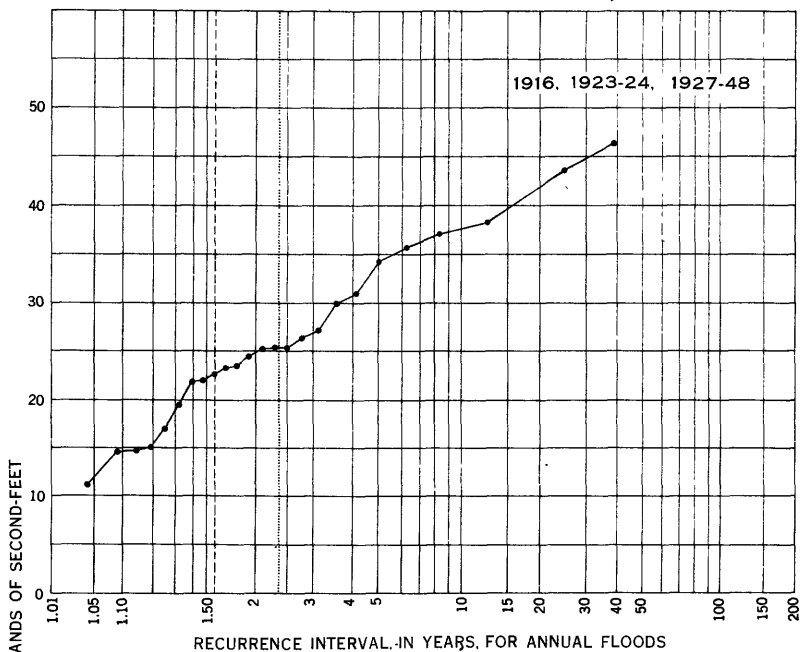
Stage-discharge relation.- Defined by current-meter measurements below 30,700 second-feet.

Maximum flood of record.- 46,200 second-feet June 19, 1916.

Remarks.- No diversion or regulation. Flood of June 19, 1916, is known to be greatest since September 1910.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1916	June	19	16.6	46,200	1	39.0	-	-
1923	May	11	9.90	17,200	18	1.39	41	0.61
		26	11.40	21,900			26	.96
1924	May	4	9.92	17,500	10	2.50	39	.64
		17	12.13	25,400			15	1.67
		4	7.52	11,400			74	.34
		15	7.94	12,700			69	.36
1927	May	1	8.25	13,600	2	12.5	66	.38
		17	12.25	27,500			11	2.27
		26	8.95	16,300			47	.53
		9	14.85	38,000			2	12.5
1928	May	25	14.2	34,100	5	5.00	5	5.00
1929	May	14	10.72	14,400	13	1.92	61	.41
		24	14.58	24,400			19	1.32
		2	11.70	16,700			44	.57
		9	11.30	15,800			51	.49
1930	Apr.	15	9.88	12,600	22	1.14	69	.36
		25	10.92	14,800			54	.46
		4	10.23	13,300			66	.38
		31	10.50	13,900			63	.40
1931	May	7	11.47	16,200	16	1.56	48	.52
		16	13.98	22,700			23	1.09
		26	10.56	14,200			63	.40
1932	May	14	15.54	27,000	7	3.57	12	2.08
		22	16.53	30,000			10	2.50
		2	11.46	16,200			49	.51
		15	12.11	17,700			38	.66
1933	Apr.	28	11.47	17,000	3	8.33	42	.60
		5	16.97	33,100			7	3.57
		16	18.22	36,800			3	8.33
1934	Apr.	25	13.27	22,000	17	1.47	25	1.00
1935	May	6	9.43	11,600	9	2.78	73	.34
		23	14.84	26,400			14	1.79
		1	12.99	21,100			28	.89
1936	Apr.	20	11.44	16,700	6	4.17	45	.56
		5	12.98	21,100			29	.86
		15	16.33	30,900			9	2.78
		31	13.15	21,700			27	.92
1937	May	5	10.06	13,900	20	1.25	65	.38
		28	11.19	17,000			43	.58
1938	Apr.	19	12.84	20,400	15	1.67	30	.83
		2	10.74	14,800			56	.45
		17	9.08	11,200			75	.33
		27	13.73	23,100			21	1.19
		30	15.2	27,000			13	1.92
1939	May	17	14.65	25,100	8	3.12	17	1.47
		30	11.63	16,700			46	.54
1940	May	12	10.84	14,700	23	1.09	58	.43
		25	10.84	14,700			59	.42
1941	May	14	9.12	11,200	24	1.04	76	.33

## South Fork Flathead River near Columbia Falls, Mont.



PEND OREILLE RIVER BASIN  
South Fork Flathead River near Columbia Falls, Mont.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1942	Apr. May	22	9.91	13,000	14	1.79	68	0.37
		11	9.02	11,200			77	.32
	27	13.38	23,300	20			1.25	
	June	8	10.98	16,100			50	.50
1943	Apr. May	20	13.31	23,000	11	2.27	22	1.14
		28	13.74	22,700			24	1.04
	June	19	14.68	25,400			16	1.56
	July	1	12.43	19,300			32	.78
1944	May	16	10.73	15,100	21	1.19	54	.46
1945	May	6	11.84	17,800	19	1.32	36	.69
		11	10.57	14,800			57	.44
	June	1	12.53	19,500			31	.81
		22	10.53	14,600			60	.42
1946	Apr.	20	10.30	14,400	12	2.08	62	.40
		27	10.79	15,300			53	.47
	May	6	11.96	18,300			34	.74
		18	10.89	15,600			52	.48
	June	29	14.58	25,100			18	1.39
		6	11.89	18,300			35	.71
1947	Apr. May	29	11.66	17,500	4	6.25	40	.62
		9	17.70	35,500			4	6.25
	May	27	12.12	18,500			33	.76
		June	10	11.77			17,800	37
	1948	Apr. May	30	9.58			12,000	1
8			9.52	11,800	72	.35		
		22	19.60	43,400	1	25.0		
		28	17.22	34,100	6	4.17		
June		29	17.22	34,100	8	3.12		
		4	16.65	32,100				
Period 1923-24, 1927-48				25,320	Mean annual			

Whitefish Creek near Kalispell, Mont.

Location.- Lat. 48°19', long. 114°16', 8 miles north of Kalispell and 8 miles upstream from mouth.

Records available.- November to December 1906 (gage heights only), July 1928 to September 1948.

Gage.- Non-recording gage read once daily prior to Oct. 16, 1930, recording gage thereafter. Datum of recording gage is 2,969.7 feet above mean sea level, datum of 1929 (Corps of Engineers bench mark).

Stage-discharge relation.- Defined by current-meter measurements.

Maximum flood of record.- 1,290 second-feet May 30, 1948.

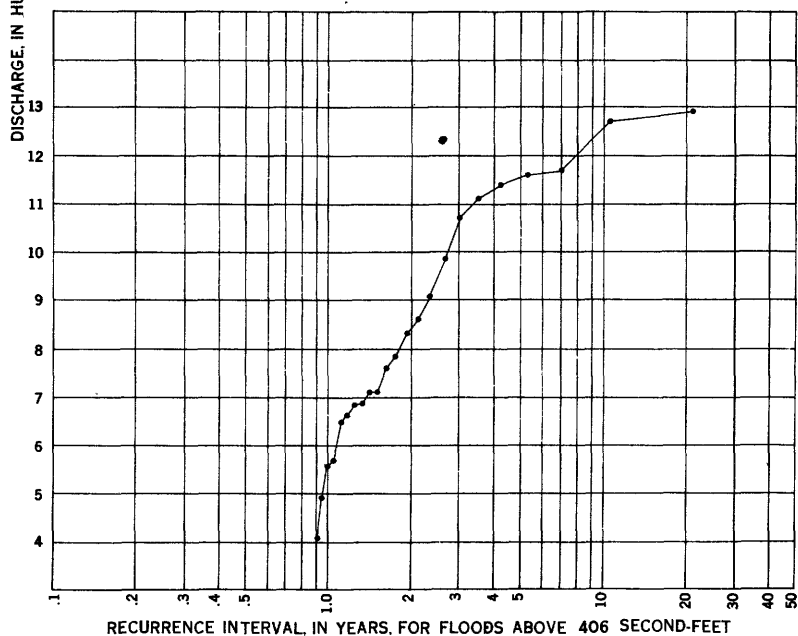
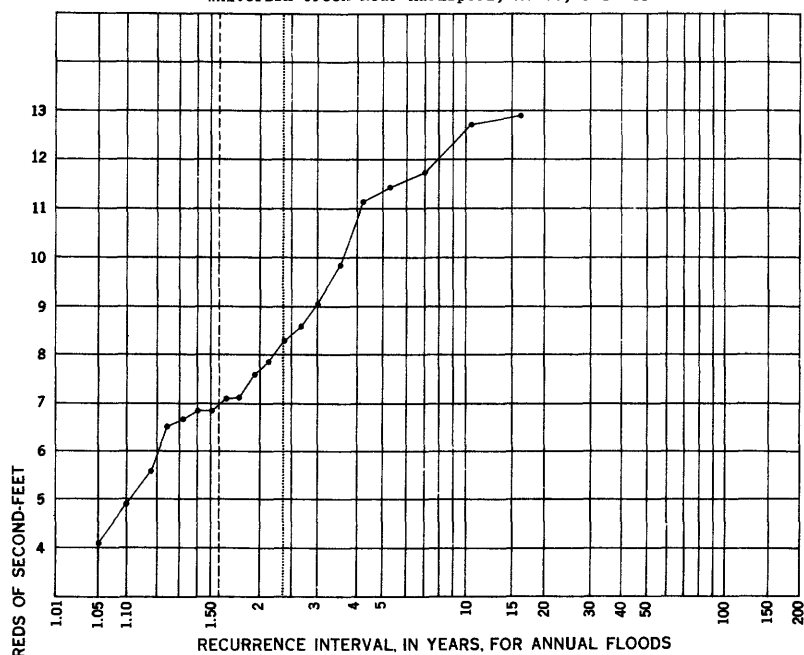
Remarks.- Some regulation by Whitefish Lake. No diversion.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1929	June	4	12.52	684	14	1.50	16	1.31
1930	June	8	12.85	827	9	2.33	11	1.91
1931	May	19	2.81	648	17	1.24	19	1.10
1932	May	24	3.84	1,070	2	10.5	7	3.00
	June	3	4.26	1,270			2	10.5
1933	June	18	4.01	1,140	4	5.25	5	4.20
1934	May	1	3.55	982	6	3.50	8	2.62
1935	June	16	3.36	905	7	3.00	9	2.33
1936	May	17	3.25	856	8	2.62	10	2.10
1937	June	8	2.84	661	16	1.31	18	1.17
1938	May	31	3.18	782	10	2.10	12	1.75
1939	May	20	3.22	757	11	1.91	13	1.62
1940	May	26	2.73	552	18	1.17	21	1.00
1941	May	6	2.60	488	19	1.10	22	.95
1942	June	6	2.98	682	15	1.40	17	1.24
1943	Apr.	22	2.76	568	13	1.62	20	1.05
	June	23	3.18	709			15	1.40
1944	May	20	2.43	406	20	1.05	23	.91
1945	June	6	3.25	710	12	1.75	14	1.50
1946	June	1	3.94	1,110	5	4.20	6	3.50
1947	May	12	4.17	1,170	3	7.00	3	7.00
	June	11	4.14	1,160			4	5.25
1948	May	30	4.41	1,290	1	21.0	1	21.0
Period 1929-49				831	Mean annual			



## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

Whitefish Creek near Kalispell, Mont., 1929-48



## PEND OREILLE RIVER BASIN

Swan River near Big Fork, Mont.

Location.- Lat. 48°01', long. 113°59', at outlet of Swan Lake, 7 miles southeast of Big Fork. At site 800 feet upstream Apr. 28, 1922, to Oct. 14, 1930. Prior to Apr. 28, 1922, at site 2 miles upstream from Swan Lake.

Drainage area.- 647 square miles.

Records available.- October 1910 to May 1911 (gage heights only), April 1922 to September 1948.

Gage.- Non-recording gage read twice daily prior to Oct. 15, 1930, recording gage thereafter at different datum.

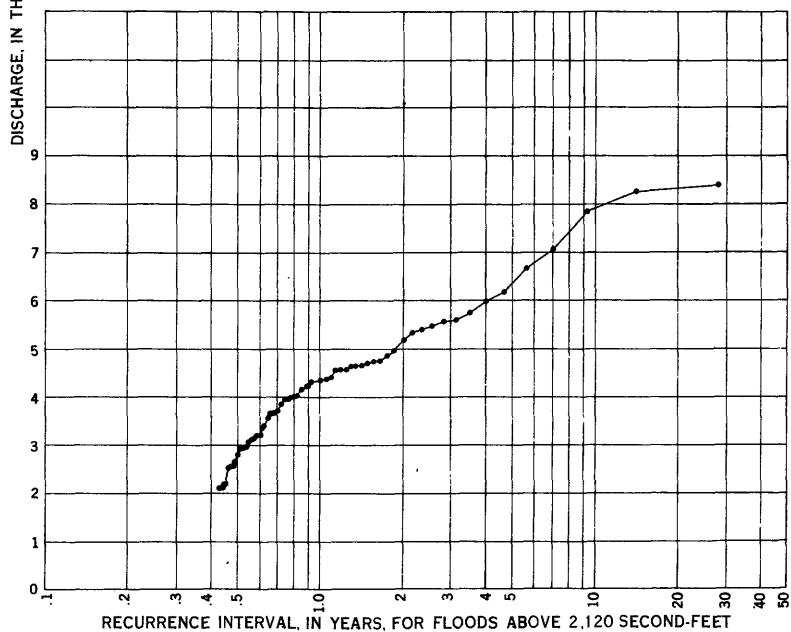
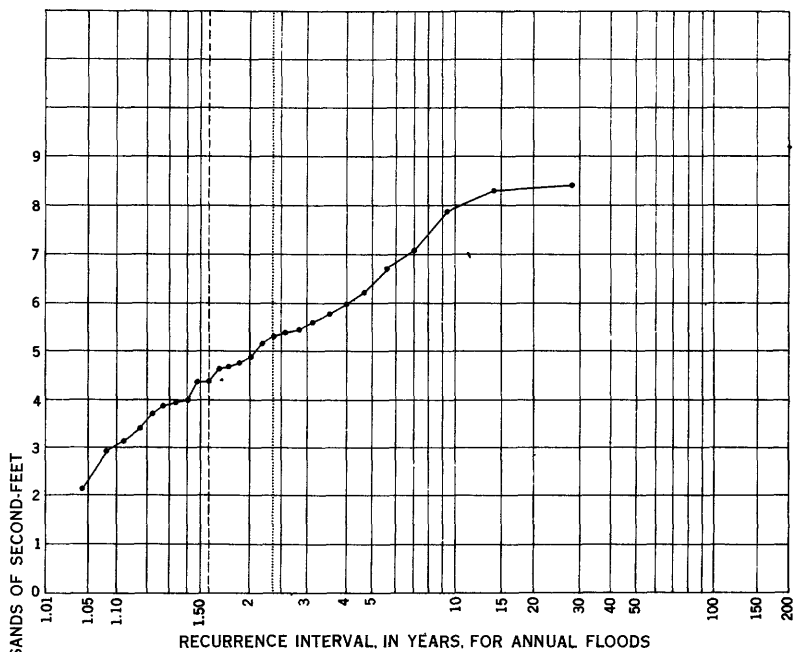
Stage-discharge relation.- Defined by current-meter measurements below 6,500 second-feet.

Maximum flood of record.- 8,400 second-feet May 24, 1948.

Remarks.- No diversion. Natural storage in Swan Lake.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1922	May	22	4.25	4,530	10	2.80	24	1.17
		8	4.82	5,440			11	2.55
1923	May	12	3.35	3,220	14	2.00	47	.60
		28	3.93	4,020			34	.82
	June	14	4.35	4,870			16	1.75
1924	May	19	4.68	5,380	11	2.55	12	2.34
1925	Apr.	14	4.24	4,530	5	5.60	25	1.12
		23	5.45	6,660			5	5.60
	June	23	3.88	4,020			35	.80
1926	Apr.	21	3.80	3,860	22	1.27	39	.72
		2	3.74	3,700			40	.70
	May	24	3.24	2,920			54	.52
1926 1927	Dec.	5	2.58	2,120	4	7.00	64	.44
		30	4.10	4,360			27	1.04
		19	4.34	4,700			19	1.47
		13	5.56	7,060			4	7.00
1928	Apr.	30	3.70	4,140	3	9.33	33	.85
		28	5.90	7,820			3	9.33
	June	30	4.00	4,640			21	1.33
1929	May	26	4.4	5,300	12	2.33	13	2.15
		12	3.80	4,310			30	.93
1930	Apr.	29	2.76	2,780	26	1.08	56	.50
		1	2.88	2,920			55	.51
1931	May	18	5.57	5,140	13	2.16	14	2.00
		3	4.63	3,400			45	.62
1932	Apr.	19	4.41	2,970	8	3.50	52	.54
		16	5.49	4,950			15	1.87
		24	5.92	5,710			8	3.50
		18	5.32	4,570			23	1.22
1933	Apr.	30	4.51	3,050	2	14.0	51	.55
		18	7.00	8,280			2	14.0
1933	Oct.	24	3.97	2,200	15	1.87	63	.44
		25	5.42	4,750			18	1.56
1934	Apr.	30	4.99	3,950			37	.76
		1	4.80	3,560			44	.64
1935	May	25	5.33	4,650	16	1.75	20	1.40
1936	Apr.	25	5.41	4,850	6	4.67	17	1.65
		17	5.97	6,180			6	4.67
		2	5.66	5,550			10	2.80
1937	May	29	4.71	3,380	24	1.17	46	.61
		23	4.56	3,130			49	.57
1938	Apr.	21	4.39	2,640	18	1.56	57	.49
		3	4.26	2,560			59	.47
		30	5.26	4,350			28	1.00

## Swan River near Big Fork, Mont., 1922-48



PEND OREILLE RIVER BASIN  
Swan River near Big Fork, Mont--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1939	May	6	5.24	4,350	19	1.47	29	0.97
	June	21	4.35	2,640			58	.48
1940	May	27	4.82	3,650	23	1.22	43	.65
1941	June	3	3.88	2,120	27	1.04	65	.43
1942	Apr.	24	4.01	2,220	20	1.40	62	.45
	May	28	5.06	3,980			36	.78
	June	10	4.91	3,690			41	.68
	July	2	4.20	2,520			61	.46
1943	Apr.	21	5.17	4,220	9	3.11	31	.90
	May	30	5.16	4,220			32	.88
	June	21	5.82	5,570			9	3.11
1944	May	20	4.53	3,120	25	1.12	50	.56
	June	3	4.18	2,550			60	.47
1945	May	17	4.46	2,960	21	1.33	53	.53
	June	4	5.01	3,940			38	.74
	June	24	4.83	3,660			42	.67
1946	May	9	4.62	3,210	17	1.65	48	.58
	June	30	5.34	4,610			22	1.27
1947	May	11	6.11	5,960	7	4.00	7	4.00
	June	12	5.32	4,380			26	1.08
1948	May	24	7.12	8,400	1	28.0	1	28.0
Period 1922-48				5,091	Mean annual			

Priest River at outlet of Priest Lake, near Coolin, Idaho

Location.- Lat. 48°29', long. 116°54', at southwest end of Priest Lake, 2 miles north-west of Coolin. Prior to Nov. 25, 1914, at site on lake just upstream from outlet.

Drainage area.- 572 square miles.

Records available.- June 1911 to September 1918 (fragmentary), May 1919 to September 1948.

Gage.- Non-recording gage read once daily prior to Nov. 25, 1914, recording gage thereafter. Datum of recording gage is 2,435.06 feet (Coast and Geodetic Survey datum) or 2,437.99 feet (Geological Survey datum) above mean sea level.

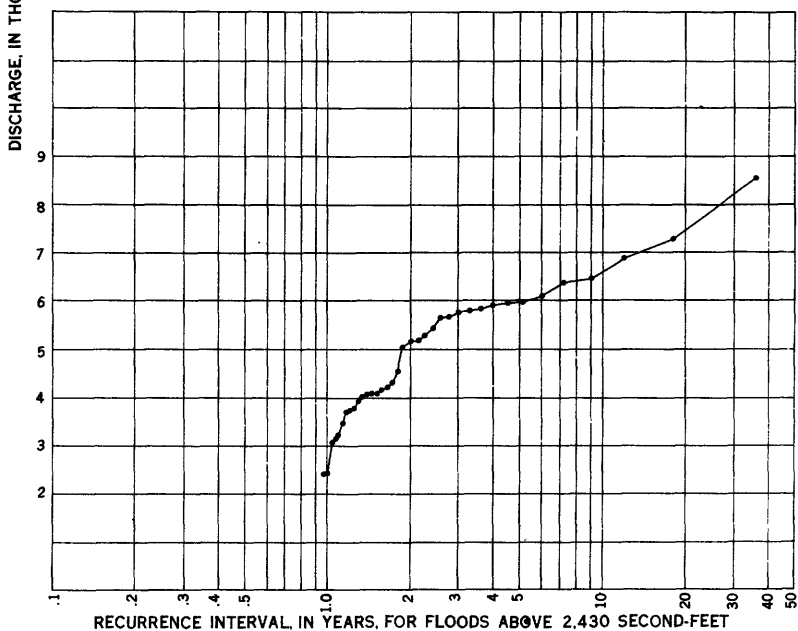
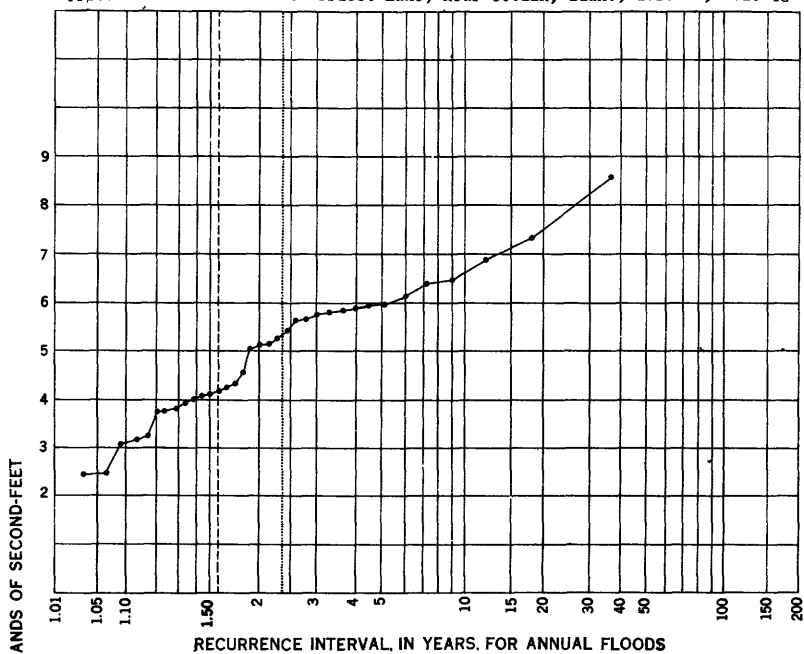
Stage-discharge relation.- Defined by current-meter measurements.

Maximum flood of record.- 8,560 second-feet May 29, 1948.

Remarks.- No diversion above station. Some regulation due to dumping logs into outlet of Priest Lake. Major change in stage-discharge relation after 1928 water year.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1913	June	5	7.42	5,970	7	5.14	7	5.14
1914	May	23	6.7	5,030	19	1.89	19	1.89
1915	May	2	3.49	2,450	34	1.06	36	1.00
1916	June	20	5.85	5,640	13	2.77	13	2.77
1917	May	30	6.83	7,290	2	18.0	2	18.0
1919	May	29	5.86	5,800	10	3.60	10	3.60
1920	May	21	4.02	3,170	32	1.13	34	1.06
1921	Apr.	25	4.23	3,480			32	1.13
	May	27	6.28	6,440	4	9.00	4	9.00
1922	June	7	5.32	5,120	18	2.00	18	2.00
1923	May	27	4.48	4,080	25	1.44	26	1.38
1924	May	20	4.64	4,220	22	1.64	22	1.64
1925	May	23	5.55	5,730	12	3.00	12	3.00
1926	May	4	4.07	3,080	33	1.09	35	1.03
1927	June	14	5.38	5,410	15	2.40	15	2.40
1928	May	28	5.18	5,250	16	2.25	16	2.25
1929	May	26	3.95	3,800	28	1.29	29	1.24
1930	Apr.	28	3.85	3,710	30	1.20	31	1.16
1931	May	17	3.98	4,310	21	1.71	21	1.71
1932	May	23	5.29	6,890	3	12.0	3	12.0
1933	June	17	4.89	5,940	8	4.50	8	4.50

Priest River at outlet of Priest Lake, near Coolin, Idaho, 1913-17, 1919-48



PEND OREILLE RIVER BASIN  
Priest River at outlet of Priest Lake, near Coolin, Idaho--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1934	Apr.	30	4.84	5,870	9	4.00	9	4.00
1935	June	1	4.35	5,130	17	2.12	17	2.12
1936	May	16	4.13	4,540	20	1.80	20	1.80
1937	May	29	5.21	3,220	31	1.16	33	1.09
1938	May	30	4.78	5,780	11	3.27	11	3.27
1939	May	5	3.62	4,010	26	1.38	27	1.33
1940	May	15	3.46	3,760	29	1.24	30	1.20
1941	May	20	3.53	3,920	27	1.33	28	1.29
1942	May	29	3.63	4,100	24	1.50	24	1.50
1943	Apr.	23	3.77	4,100			25	1.44
	June	1	3.48	4,180	23	1.57	23	1.57
1944	May	17	2.35	2,430	35	1.03	37	.97
1945	May	17	4.27	5,620	14	2.57	14	2.57
1946	May	29	4.64	6,390	5	7.20	5	7.20
1947	May	11	4.20	6,100	6	6.00	6	6.00
1948	May	29	5.53	8,560	1	36.0	1	36.0
Period 1913-17, 1919-48				4,941	Mean annual			

## KETTLE RIVER BASIN

Kettle River near Ferry, Wash.  
(International gaging station)

Location.- Lat. 48°58'40", long. 118°46'10", 1½ miles south of international boundary and Ferry and 3 miles upstream from Toroda Creek.

Drainage area.- 2,220 square miles.

Records available.- August 1928 to September 1948.

Gage.- Recording.- Datum of gage is 1,840.00 feet above mean sea level (subject to correction for datum of 1929).

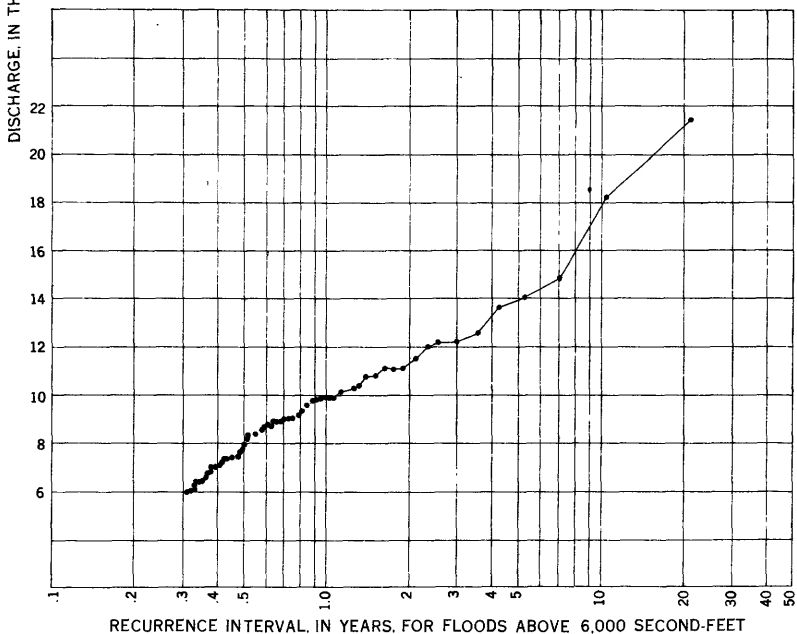
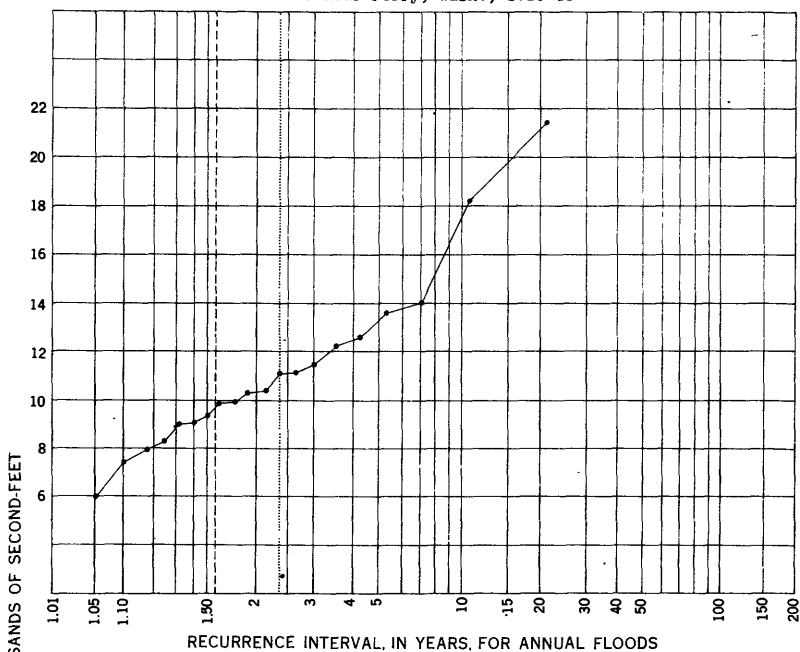
Stage-discharge relation.- Defined by current-meter measurements below 16,700 second-feet.

Maximum flood of record.- 21,400 second-feet May 29, 1948.

Remarks.- Several small diversions above station for irrigation. This station is one of the international gaging stations maintained by the United States under agreement with Canada.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1929	May	24	15.15	7,420	19	1.10	47	0.45
	June	2	14.73	6,400			62	.34
1930	June	1	14.46	6,000	20	1.05	68	.31
1931	May	7	15.18	7,420			48	.44
		15	15.90	9,020	16	1.31	28	.75
1932	May	10	16.87	10,100			18	1.17
		22	17.01	10,300	11	1.91	17	1.24
	June	3	16.32	8,970			30	.70
		15	16.14	8,590			37	.57
1933	Apr	29	16.11	8,700			34	.62
	May	14	15.92	8,310			40	.52
		27	17.19	11,100			11	1.91
	June	5	17.10	10,800			14	1.50
		17	18.40	14,000	3	7.00	4	5.25
		26	15.50	7,550			45	.47
	July	2	15.60	7,740			43	.49
1934	Apr.	14	14.89	6,410			61	.34
		28	17.43	11,500	7	3.00	10	2.10
	May	16	15.17	6,980			54	.39
		26	14.72	6,030			64	.33
		31	14.69	6,030			65	.32
1935	May	6	14.81	6,220			63	.33
		23	17.23	11,100	8	2.62	12	1.75
		31	16.64	9,730			24	.87
	June	6	16.16	8,900			31	.68
	July	2	16.14	8,700			35	.60

Kettle River near Ferry, Wash., 1929-48



KETTLE RIVER BASIN  
Kettle River near Ferry, Wash.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1936	Apr. May	26	17.22	11,100	9	2.33	13	1.62
		5	16.74	9,940			19	1.10
	15	16.54	9,520	25			.84	
	29	15.19	6,980	55			.38	
	3	16.25	8,900	32			.66	
1937	May June	27 3	16.06 16.66	8,700 9,940	12	1.75	36	.58
	19	14.70	6,030	20			1.05	
	23	14.73	6,030	66			.32	
				67			.31	
1938	May	1	16.24	8,900	6	3.50	33	.64
		13	15.28	7,170			51	.41
		26	17.66	12,200			7	3.00
1939	May	4	16.03	8,500	10	2.10	38	.55
		17	16.86	10,400			16	1.31
		29	15.38	7,360			49	.43
1940	May June	11 26 1	16.43 16.83 15.79	8,990 9,930 7,680	13	1.62	29	.72
				21			1.00	
				44			.48	
1941	May	2	16.38	9,310	14	1.50	26	.81
		13	15.12	6,630			59	.36
		17	15.00	6,440			60	.35
1942	Apr. May	22 14	15.31 15.68	6,790 7,550	2	10.5	57	.37
	27	20.54	18,200	46			.46	
	June	7	16.78	9,790			2	10.5
		16	15.50	7,170			23	.91
1943	May June	27 10 18	15.92 15.41 15.26	7,950 6,980 6,790	18	1.17	52	.40
				42			.50	
				56			.37	
				58			.36	
1944	May June	16 2	15.53 15.96	7,310 8,280	17	1.24	50	.42
				41			.51	
1945	May	6	17.21	10,800	5	4.20	15	1.40
		15	16.78	9,920			22	.95
	June	1	18.25	12,500			6	3.50
		5	18.10	12,200			8	2.62
1946	Apr. May	27 10	16.30 18.01	8,400 12,000	4	5.25	39	.54
	29	18.66	13,600	9			2.33	
	June	15	15.62	7,170			5	4.20
							53	.40
1947	May	8	16.39	9,070	15	1.40	27	.78
1948	May June	29 11	21.15 18.76	m21,400 m14,800	1	21.0	1	21.0
				3			7.00	
Period 1929-48				11,160	Mean annual			

m Provisional, subject to revision.



## KETTLE RIVER BASIN

Kettle River near Laurier, Wash.  
(International gaging station)

Location.- Lat. 48°50'50", long. 118°13'00", 500 feet downstream from Deep Creek, 1½ miles southeast of Laurier, and 12 miles upstream from Boulder Creek.

Drainage area.- 3,800 square miles.

Records available.- September 1929 to September 1948.

Gage.- Recording.

Stage-discharge relation.- Defined by current-meter measurements below 28,000 second-feet, and by slope-area measurement of peak discharge.

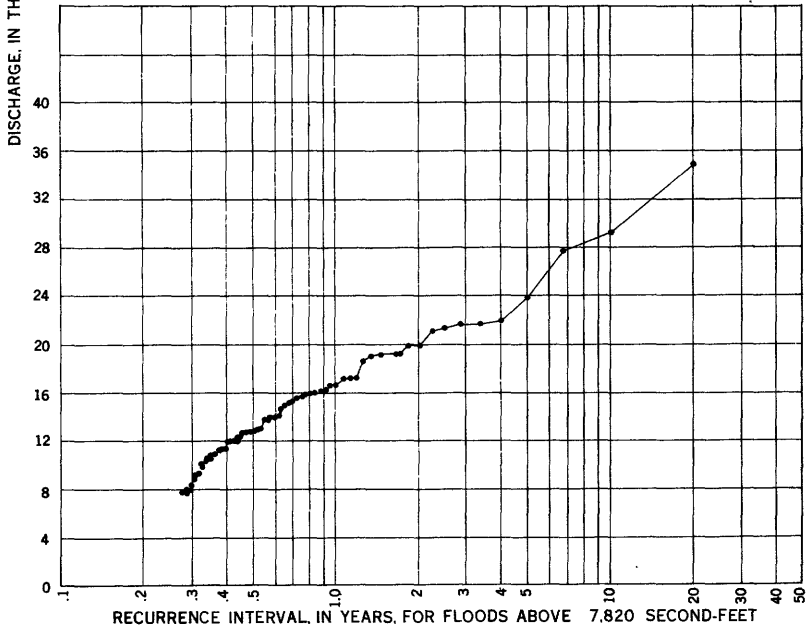
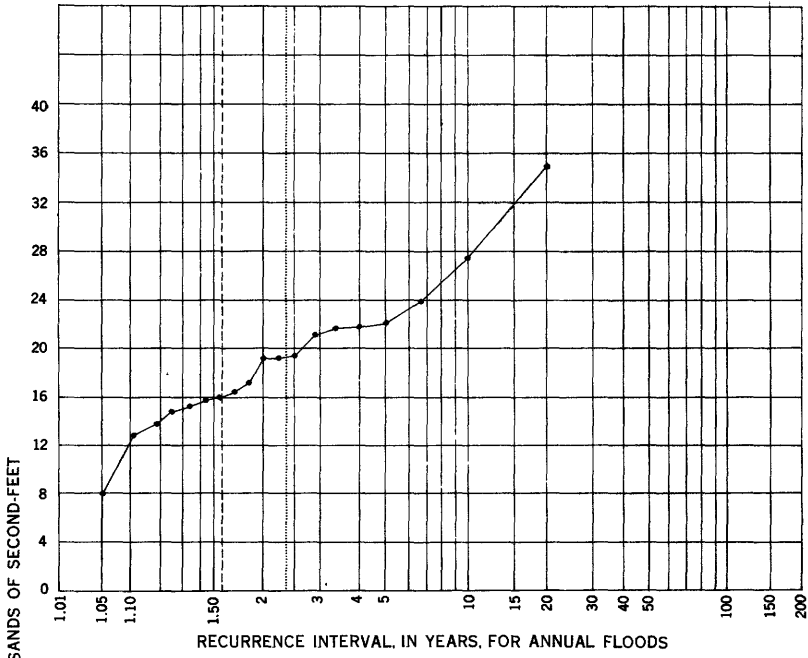
Maximum flood of record.- 34,800 second-feet May 29, 1948 (gage height, 17.25 feet).

Historical data.- Maximum stage known, about 22 feet sometime in May or June 1894, from information by local residents.

Remarks.- Flow regulated by storage on North Fork at Grand Forks, British Columbia. Numerous small diversions for irrigation and domestic supply. This station is one of the international gaging stations maintained by the United States under agreement with Canada.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1930	June	1	8.64	7,820	19	1.05	72	0.28
1931	May	8	10.71	12,500	16	1.25	43	.46
		15	11.58	14,800			31	.64
		2	8.59	7,820			73	.27
1932	Apr.	15	10.48	12,000	9	2.22	47	.43
		11	13.20	19,200			13	1.54
	May	22	13.00	18,600			16	1.25
		4	11.31	14,000			34	.59
		16	11.28	14,000			35	.57
1933	Apr.	29	12.10	16,600	3	6.67	20	1.00
		15	11.8	15,700			27	.74
	May	27	13.15	19,900			10	2.00
		6	12.94	19,000			14	1.43
		17	14.48	23,800			4	5.00
	July	3	10.24	11,200			53	.38
1934	Apr.	14	10.73	12,600	7	2.86	41	.49
		26	13.60	21,100			9	2.22
	May	17	10.54	12,000			48	.42
		27	9.79	10,300			61	.33
1935	May	7	10.53	12,000	8	2.50	49	.41
		24	13.03	19,300			12	1.67
	June	1	11.92	16,000			24	.83
		7	11.26	14,200			33	.61
	July	3	10.20	11,300			52	.38
1936	Apr.	26	12.93	19,000	10	2.00	15	1.33
		6	11.92	16,000			25	.80
	May	16	11.53	14,800			32	.62
		3	10.66	12,600			42	.48
		18	8.68	8,000			70	.29
1937	May	5	9.70	10,100	15	1.33	63	.32
		28	11.13	13,700			37	.54
	June	4	11.66	15,400			29	.69
		24	10.00	10,900			56	.36
1938	May	2	12.26	17,200	5	4.00	17	1.18
		27	13.82	21,700			6	3.33
1939	May	5	11.60	15,200	12	1.67	30	.67
		17	12.05	16,300			22	.91
		30	9.90	10,700			59	.34
1940	Apr.	28	9.69	10,200	11	1.82	62	.32
		12	12.06	16,600			21	.95
	May	26	12.33	17,200			18	1.11
		2	10.53	12,200			46	.43
1941	Apr.	13	9.23	8,980	14	1.43	67	.30
		3	11.80	15,700			28	.71
	May	18	10.61	12,500			44	.45
		1	9.33	9,210			65	.31
		9	8.93	8,290			68	.29
		21	8.67	7,850			71	.28

Kettle River near Laurier, Wash., 1930-48



## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

KETTLE RIVER BASIN  
Kettle River near Laurier, Wash.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-foot)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1942	Apr.	22	10.67	12,700	2	10.0	40	0.50
	May	15	10.75	13,000			38	.53
		28	15.73	27,400			3	6.67
	June	8	12.30	17,200			19	1.25
1943	Apr.	20	10.05	10,900	17	1.18	57	.35
	May	28	11.09	13,800			36	.56
		11	10.23	11,400			51	.39
	June	18	10.10	11,200			54	.37
1944	May	10	9.17	9,150	18	1.11	66	.30
		17	10.46	12,300			45	.44
	June	3	10.72	12,800			39	.51
		15	8.78	8,230			69	.29
1945	May	6	13.24	19,900	6	3.33	11	1.82
	June	1	13.82	21,700			7	2.86
1946	Apr.	-	10.0	11,000	4	5.00	55	.36
		27	12.01	16,300			23	.87
	May	10	13.99	22,000			5	4.00
		29	13.66	21,400			8	2.50
	June	16	10.45	12,000			50	.40
1947	Apr.	30	9.94	10,800	13	1.54	58	.35
	May	9	11.93	16,000			26	.77
		28	9.26	9,400			64	.51
1948	Apr.	23	9.81	m10,600	1	20.0	60	.33
	May	22	15.77	m29,200			2	10.0
		29	17.25	m34,800				20.0
Period 1930-48				18,900	Mean annual			

m Provisional, subject to revision.

## COLVILLE RIVER BASIN

Colville River at Kettle Falls, Wash.  
(Formerly published as Colville River at Meyers Falls)

Location.- Lat. 48°36', long. 118°04', 500 feet downstream from Stevens County Light & Power Co.'s plant at foot of Meyers Falls; half a mile south of town of Kettle Falls and 5 miles upstream from mouth. Prior to Oct. 21, 1932, at site 500 feet upstream, at different datum.

Records available.- October 1922 to September 1948.

Gage.- Non-recording gage read twice daily. Gage destroyed Apr. 20, 1938; re-established May 14, 1938, at site 200 feet downstream at datum 5 feet lower.

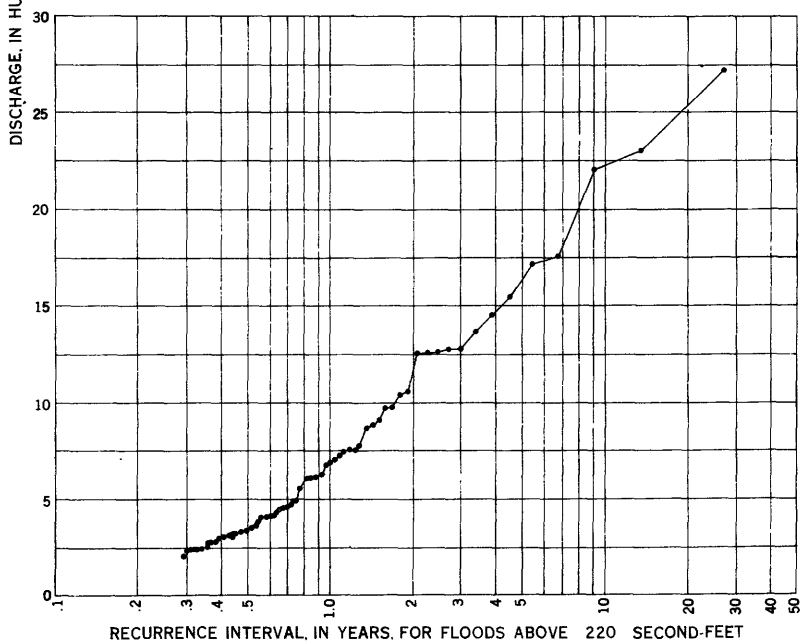
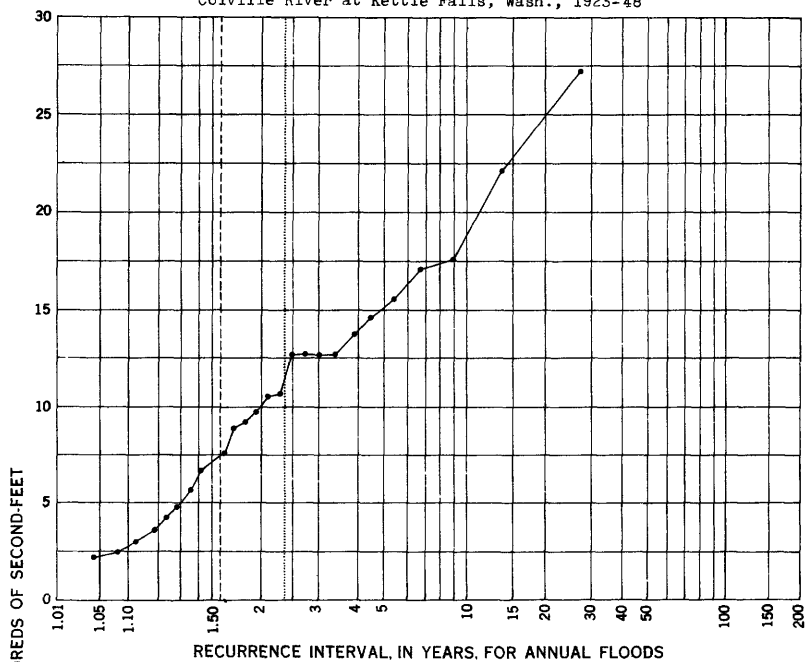
Stage-discharge relation.- Defined by current-meter measurements below 2,280 second-feet.

Maximum flood of record.- 2,720 second-feet Apr. 20, 1938.

Remarks.- Several ditches divert water above station for irrigation. Slight regulation for power by small reservoir above falls. Gage heights are from graphs based on gage readings.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1922	Dec.	28	2.32	k240	15	1.80	81	0.33
1923	Jan.	13	2.50	358			56	.48
	Apr.	20	3.92	916			18	1.50
	June	14	2.69	404			49	.55
	July	10	2.43	322			62	.44
1924	Feb.	8	2.73	422	22	1.23	44	.61
	Mar.	3	2.40	307			68	.40
	Apr.	14	2.30	277			74	.36
1925	Feb.	10	3.71	k772	9	3.00	21	1.28
	Mar.	4	3.42	683			27	1.00
	Apr.	19	4.65	1,270			10	2.70
	June	12	2.44	310			67	.40

Colville River at Kettle Falls, Wash., 1923-48



COLVILLE RIVER BASIN  
Colville River at Kettle Falls, Wash.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1926	Feb.	12	2.38	285	24	1.12	72	0.38
	Apr.	19	2.39	285			71	.37
1926	Dec.	3	2.70	357	8	3.38	51	.53
1927	Jan.	5	2.30	246			78	.35
	May	1	4.95	1,280			9	3.00
	June	12	3.74	730			24	1.12
	Sept.	15	2.85	417			45	.60
1927	Oct.	7	2.58	356	11	2.46	52	.52
	Dec.	5	3.45	625			29	.93
1928	Jan.	13	2.90	450			41	.66
	Feb.	7	2.98	485			37	.73
	Apr.	3	4.55	1,260			12	2.25
	May	1	4.55	1,260			13	2.08
	July	5	2.43	324			61	.44
1929	Mar.	14	2.55	356	23	1.18	53	.51
	Apr.	23	2.50	340			55	.49
1930	Feb.	25	2.13	1,220	26	1.04	91	.30
1931	Mar.	23	2.14	237	25	1.08	87	.31
	Apr.	9	2.16	237			86	.31
1932	Mar.	5	2.84	461	3	9.00	39	.69
	Apr.	27	5.55	1,760			4	6.75
1933	Apr.	30	4.44	1,540	5	5.40	6	4.50
1933	Dec.	25	2.89	1,600	13	2.08	34	.79
1934	Jan.	28	3.15	820			20	1.35
	Apr.	3	3.65	1,040			15	1.80
1935	Jan.	8	1.75	220	7	3.86	92	.29
	Feb.	5	2.29	430			43	.63
	Apr.	28	4.08	1,380			8	3.38
	July	3	1.79	239			83	.32
1936	Mar.	7	2.15	348	17	1.59	54	.50
	Apr.	27	2.97	753			23	1.17
	June	10	1.80	237			88	.31
1937	Mar.	19	2.03	314	18	1.50	63	.43
	Apr.	22	2.88	703			26	1.04
	June	24	2.17	331			60	.45
1937	Nov.	28	2.09	312	1	27.0	66	.41
	Dec.	20	1.90	244			79	.34
1938	Jan.	1	2.44	458			40	.68
		23	2.75	605			33	.82
	Mar.	22	5.57	2,300			2	13.5
	Apr.	20	6.10	2,720			1	27.0
1939	Jan.	4	6.08	332	20	1.35	59	.46
	Mar.	28	6.82	620			30	.90
1939	Dec.	18	5.86	237	6	4.50	89	.30
1940	Feb.	13	5.80	220			93	.29
	Mar.	8	6.78	620			31	.87
	Apr.	4	8.26	1,450			7	3.86
1940	Dec.	29	5.95	304	16	1.69	69	.39
1941	Jan.	31	6.20	389			50	.54
	Mar.	10	7.30	880			19	1.42
	May	19	6.60	547			35	.77
	Sept.	21	5.73	244			80	.34
1941	Nov.	18	6.03	337	10	2.70	57	.47
	Dec.	6	6.25	408			46	.59
1942		26	7.02	730			25	1.08
	Feb.	11	6.68	608			32	.84
	Apr.	16	7.40	973			16	1.69
	May	29	7.88	1,270			11	2.46
1942	Nov.	25	5.90	280	14	1.93	73	.37
1943	Dec.	18	6.00	314			65	.42
	Apr.	16	7.40	973			17	1.59
	June	22	6.00	314			64	.42
1944	Feb.	9	5.78	248	21	1.28	77	.35
	Mar.	10	6.39	470			38	.71
	Apr.	18	6.20	408			47	.57
	May	26	5.90	264			75	.36

**COLVILLE RIVER BASIN**  
Colville River at Kettle Falls, Wash.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-foot)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1945	Feb.	9	6.46	492	12	2.25	36	0.75
	Mar.	28	6.95	758			22	1.23
	May	6	7.65	1,060			14	1.93
1946	Jan.	7, 8	5.95	297	4	6.75	70	.39
	Apr.	22	8.72	1,710			5	5.40
	June	29	6.00	334			58	.47
1946	Dec.	8	5.72	238	19	1.42	84	.32
1947	Jan.	25	5.75	1,240			82	.33
	Feb.	14	6.20	408			48	.56
	Apr.	21	6.80	668			28	.96
	June	10	5.75	253			76	.36
1947	Oct.	23	5.68	238	2	13.5	85	.32
1948	Jan.	9	5.66	m224			90	.30
	Feb.	22	6.30	m448			42	.64
	May	15	9.45	m2,200			3	9.00
Period 1923-48				1,060	Mean annual			

k Estimated.

m Provisional, subject to revision.

**SPOKANE RIVER BASIN**

Coeur d'Alene River near Cataldo, Idaho

Location.- Lat. 47°34', long. 116°18', 1½ miles upstream from Cataldo and 3 miles downstream from South Fork.

Drainage area.- 1,220 square miles.

Records available.- April 1911 to December 1912, July 1920 to September 1948.

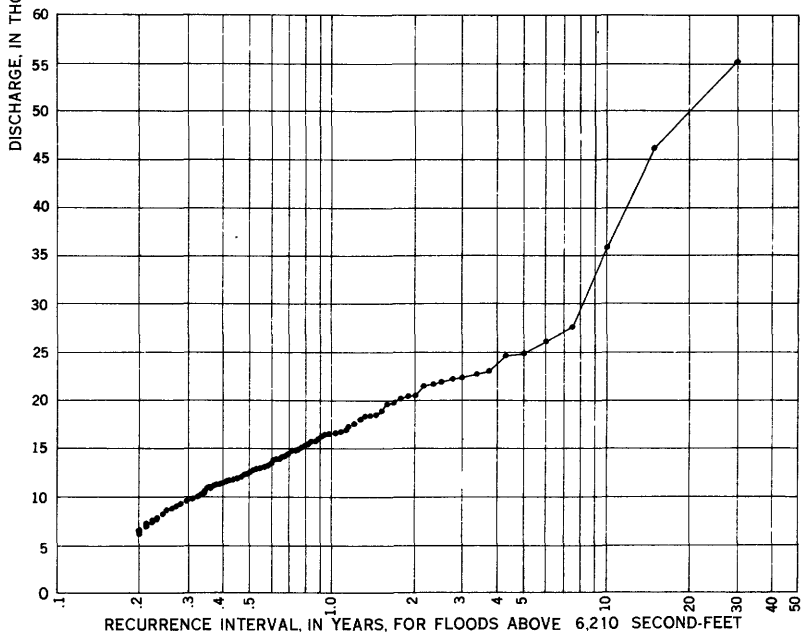
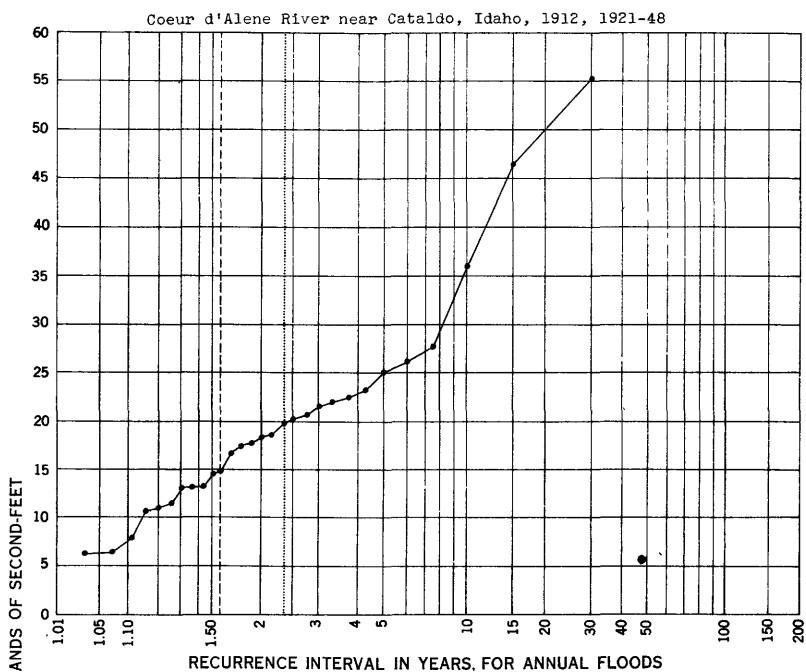
Gage.- Non-recording gage read once daily prior to Oct. 11, 1925, recording gage thereafter. Datum of gage since July 1920 is 2,100 feet above mean sea level (Geological Survey datum).

Stage-discharge relation.- Defined by current-meter measurements below 22,700 second-feet.

Maximum flood of record.- 55,300 second-feet Dec. 22 or 23, 1933.

Remarks.- No appreciable diversion or regulation above station. Gage heights for period when non-recording gage was used are from graphs based on gage readings. Stage-discharge relation frequently affected by log jams and occasionally by backwater from Coeur d'Alene Lake.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1912	Apr.	5	9.45	11,300	19	1.58	78	0.38
		11	10.80	14,900			41	.73
		10	10.10	13,000			56	.54
1920	Dec.	30	47.00	16,100	6	5.00	34	.88
1921	Feb.	13	48.00	19,000			20	1.50
	Mar.	18	50.00	25,000			6	5.00
	Apr.	25	43.87	7,790			136	.22
		3	44.00	8,070			129	.23
		14	45.50	11,800			70	.43
		23	47.20	16,700			30	1.00
	May	8	47.26	15,800			35	.86
		15	46.00	11,800			69	.43
1921	Dec.	12	48.40	20,200	12	2.50	17	1.77
1922	Apr.	8	44.88	10,200			91	.33
		23	44.72	9,770	16	1.88	99	.30
	May	5	46.69	15,100			39	.77
		18	48.30	18,500			22	1.36
	June	2	43.12	6,240			152	.20
1923	Jan.	8	45.50	11,800	16	1.88	71	.42
		2	45.42	11,600			73	.41
		18	47.52	17,600			25	1.20
		28	45.56	12,000			65	.46
	May	8	46.60	14,900	18	1.67	42	.71
		2	43.80	7,720			137	.22
1924	Feb.	13	46.00	13,200	18	1.67	52	.58
		13	43.86	7,910			131	.23
		4	47.47	16,600			31	.97
		12	45.00	10,000			94	.32



SPOKANE RIVER BASIN  
Coeur d'Alene River near Cataldo, Idaho--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1924	Dec.	14	44.00	7,820	4	7.50	135	0.22
1925	Feb.	1	46.20	13,100			53	.57
		5	51.3	27,600			4	7.50
	Mar.	5	43.12	6,430			151	.20
		26	45.70	11,900			66	.45
	Apr.	4	45.83	12,200			64	.47
		12	49.30	21,700			13	2.31
		18	46.93	15,000			40	.75
	May	7	44.45	9,090			111	.27
		16	44.05	8,250			124	.24
		22	44.25	8,670			119	.25
1926	Apr.	19	45.30	11,000	25	1.20	84	.36
1926	Nov.	30	45.72	11,900	5	6.00	67	.45
	Dec.	3	46.28	13,400			51	.59
1927	Feb.	21	43.78	7,830			134	.22
	Apr.	15	44.22	8,670			120	.25
		27	50.78	26,100			5	6.00
	May	16	47.88	16,400			33	.91
	June	9	44.39	8,460			122	.25
1927	Nov.	7	44.75	9,610			103	.29
		26	48.37	18,500			23	1.30
	Dec.	3	45.75	11,900			68	.44
1928	Jan.	13	44.88	9,830	14	2.14	97	.31
	Mar.	11	44.81	9,610			102	.29
		23	45.64	11,400			75	.40
	Apr.	1	45.14	10,300			89	.34
		28	46.33	13,100			54	.56
	May	8	46.95	14,800			43	.70
1929	Mar.	29	43.86	7,670			138	.22
	Apr.	29	45.58	11,400			76	.40
	May	14	44.40	8,730			117	.26
1930	Feb.	20	43.60	7,060			146	.21
	Mar.	30	43.47	6,880	27	1.11	147	.20
		8	43.95	7,880			133	.23
	Apr.	14	43.74	7,260			145	.21
1931	Mar.	22	45.74	11,300			79	.38
	Apr.	2	44.65	8,630			115	.26
		8	46.45	13,100			55	.55
	May	1	44.53	8,630			116	.26
1932	Feb.	28	47.70	16,800			28	1.07
	Mar.	20	44.65	9,470			106	.28
	Apr.	3	46.67	14,200			45	.67
		14	49.58	22,400	8	3.75	10	3.00
	May	8	47.52	15,800			36	.83
		23	46.26	12,400			61	.49
1932	Nov.	14	44.14	7,990			130	.23
	Dec.	3	44.79	9,470			107	.28
1933	Apr.	4	43.88	7,590			139	.22
		28	49.44	21,500			14	2.14
	May	15	45.74	11,300			80	.38
		27	45.61	11,000			85	.35
		31	45.33	10,300			90	.33
	June	10	47.83	16,600			32	.94
1933	Nov.	3	45.68	11,300	1	30.0	81	.37
	Dec.	7	43.98	7,580			140	.21
		11	50.17	24,700			7	4.29
		23	56.9	55,300			1	30.0
1934	Jan.	4	48.53	22,800			9	3.33
		24	47.66	16,800			29	1.03
	Mar.	3	44.10	7,390			141	.21
		16	44.07	7,390			142	.21
		29	49.88	22,200			11	2.73
1934	Dec.	22	43.40	6,700			148	.20
1935	Mar.	14	44.10	8,100	20	1.50	128	.23
	Apr.	21	46.70	14,200			46	.65
		27	46.00	12,400			62	.48
	May	6	46.79	14,400			44	.68
		23	45.53	11,600			74	.41
1936	Apr.	19	49.40	23,100	7	4.29	8	3.75
	May	12	44.57	9,140			110	.27



SPOKANE RIVER BASIN  
Coeur d'Alene River near Cataldo, Idaho--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1937	Apr.	15	46.78	15,500	17	1.76	37	0.81
		21	46.10	13,500			50	.60
		27	45.70	12,400			63	.48
	May	4	47.40	17,300			26	1.15
1938	Mar.	17	44.23	8,570	2	15.0	121	.25
	Apr.	19	55.15	46,300			2	15.0
	May	14	43.49	6,440			149	.20
1939	Mar.	26	45.17	10,500	22	1.36	88	.34
	Apr.	3	44.90	9,750			100	.30
		22	45.62	11,800			72	.42
		29	46.17	13,000			57	.53
1940	Feb.	29	44.00	7,900	26	1.15	132	.23
	Mar.	28	45.11	10,700			87	.34
	Apr.	10	44.40	9,030			112	.27
		15	44.00	8,120			126	.24
1941	May	19	43.35	6,440	28	1.07	150	.20
1941	Dec.	4	44.54	9,030	23	1.30	113	.27
		20	45.97	13,000			58	.52
1942	Apr.	12	44.86	10,200			92	.33
		22	44.01	8,120			127	.24
1942	Nov.	24	45.41	11,000	9	3.33	86	.35
1943	Mar.	28	45.24	11,400			77	.39
	Apr.	2	46.10	14,000			47	.64
		8	45.68	12,800			59	.51
		15	48.40	22,000			12	2.50
	May	2	44.64	9,790			98	.31
		23	44.26	9,010			114	.26
1944	Apr.	13	43.73	6,210	29	1.03	153	.20
1945	Jan.	14	45.20	9,530	15	2.00	104	.29
	Feb.	9	45.35	11,300			82	.37
	Apr.	22	44.02	8,200			125	.24
	May	5	47.35	18,200			24	1.25
1945	Dec.	29	45.55	12,600	13	2.31	60	.50
1946	Mar.	28	46.33	15,400			38	.79
	Apr.	20	47.82	19,800			18	1.67
		27	47.76	19,700			19	1.58
	May	5	46.85	17,000			27	1.11
		18	43.94	8,680			118	.25
1946	Nov.	19	44.92	11,200	3	10.0	83	.36
		28	44.24	9,660			101	.30
	Dec.	15	51.35	35,800			3	10.0
1947	Jan.	24	44.32	9,190			109	.28
	Feb.	16	43.62	7,310			143	.21
	Mar.	23	43.87	8,270			123	.24
	Apr.	1	43.43	7,270			144	.21
		20	44.47	9,890			96	.31
		29	44.48	9,950			95	.32
	May	3	44.28	9,450			108	.28
1948	Jan.	8	44.43	9,480	11	2.73	105	.29
	Apr.	18	7.99	20,500			16	1.88
		22	48.03	20,600			15	2.00
		30	44.71	10,100			93	.32
	May	8	46.10	14,000			48	.62
		14	46.10	14,000			49	.61
		21	47.47	18,600			21	1.43
Period 1912, 1921-48				19,860	Mean annual			

## SPOKANE RIVER BASIN

## Spokane River at Post Falls, Idaho

Location.- Lat. 47°42', long. 116°58', 1,500 feet downstream from power plant of Washington Water Power Co., 3,300 feet downstream from intake of Spokane Valley Farms Co.'s canal, and 1 mile west of Post Falls.

Drainage area.- 3,880 square miles.

Records available.- January 1913 to September 1948.

Gage.- Non-recording gage read once daily prior to Nov. 22, 1920; recording gage thereafter. Datum of gage is 2,000 feet above mean sea level, unadjusted.

Stage-discharge relation.- Defined by current-meter measurements below 40,100 second-feet.

Maximum flood of record.- 50,100 second-feet when recorder was not operating Dec. 25, 1933 (determined from unpublished records collected by Washington Water Power Co.)

Remarks.- Spokane Valley Farms Co.'s canal and Rathdrum Prairie canal divert water above gage for irrigation. Regulation by Coeur d'Alene Lake at all but extreme high stages, at which time flow is affected by natural storage in lake (usable capacity, 160,000 acre-feet). Gage heights for period when non-recording gage was used are from graphs based on gage readings. Annual peaks are tabulated for information only; no computations of flood frequency are warranted owing to effects of regulation.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1913	May	30	77.82	31,500				
1914	Apr.	19	74.80	20,600				
1915	Apr.	21	72.32	12,000				
1916	May	9	76.73	28,000				
1917	May	18	79.23	39,800				
1918	Jan.	3	79.12	39,200				
1919	May	2	76.00	25,800				
1920	May	19	74.25	18,800				
1921	May	20	74.32	25,900				
1922	May	22	74.12	24,900				
1923	May	13	73.35	21,400				
1924	May	17	72.52	17,500				
1925	Apr.	19	75.22	30,600				
1926	Apr.	29	72.13	p15,800				
1927	May	3	74.68	27,900				
1928	May	14	74.45	26,300				
1929	May	23	71.76	14,400				
1930	Mar.	30	71.53	p13,200				
1931	Apr.	14	72.13	15,600				
1932	May	15	75.72	32,400				
1933	May	1	74.93	28,900				
1933	Dec.	25		50,100				
1935	May	9	75.47	25,500				
1936	Apr.	26	77.81	35,400				
1937	May	8	75.00	23,100				
1938	Apr.	22	77.39	33,500				
1939	May	6	75.00	23,200				
1940	Apr.	17	73.57	p17,500				
1941	May	19		p18,000				
1942	May	26	74.57	p21,600				
1943	Apr.	22	77.68	34,900				
1944	Apr.	15	71.30	p10,000				
1945	May	11	75.22	23,700				
1946	May	10, 11	76.53	29,400				
1946	Dec.	18	75.68	25,790				
1948	May	30	78.98	40,300				
Period				Mean annual				

p Affected by regulation.

q No gage-height record; discharge computed on basis of records for station at Spokane.

## SPOKANE RIVER BASIN

Spokane River at Spokane, Wash.

Location.- Lat. 47°39'30", long. 117°26'50", at Cochran Street in Spokane, 1 mile downstream from Spokane Falls and half a mile upstream from Latah Creek. Prior to July 1, 1921, at various sites above Spokane Falls in Spokane.

Drainage area.- 4,350 square miles.

Records available.- April 1891 to September 1948.

Gage.- Non-recording gage read once daily prior to July 31, 1915, recording gage thereafter. Gage datum elevations are as follows: Mar. 22, 1891, to Oct. 24, 1896, 1,803.52 feet above mean sea level; Oct. 25, 1896, to July 23, 1911, unknown; July 24, 1911, to June 30, 1921, 1,800 feet above mean sea level; since July 1, 1921, 1,700 feet above mean sea level. Elevations subject to correction to datum of 1929.

Stage-discharge relation.- Defined by current-meter measurements below 45,200 second-feet.

Maximum flood of record.- 49,000 second-feet (estimated) May 31, 1894.

Remarks.- Water for irrigation diverted above station by Spokane Valley Farms Co.; maximum diversion, 304 second-feet. Regulation for power operations by Coeur d'Alene Lake at all but extreme high stages, at which time flow is affected by natural storage in lake (usable capacity, 160,000 acre-feet). Slight regulation by pondage at Spokane. Annual peaks are tabulated for information only; no computations of flood frequency are warranted owing to effects of regulation.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1892	May	31	9.00	21,800				
1893	May	21	11.45	37,500				
1894	May	31	12.42	49,000				
1895	May	10	7.67	17,100				
1896	June	7	8.92	21,400				
1897	Apr.	23	11.80	33,900				
1898	May	1	10.40	27,200				
1899	May	29	10.80	28,900				
1900	Apr.	10	7.60	17,000				
1901	May	20	9.10	22,200				
1902	May	26	9.80	24,800				
1903	June	6	9.85	23,900				
1904	Apr.	23	12.10	27,900				
1905	June	8	6.0	9,510				
1906	Apr.	27	9.31	18,400				
1907	May	23	27.22	25,800				
1908	Apr.	27	27.35	26,300				
1909	June	7	25.8	19,400				
1910	Mar.	25	29.25	28,100				
1911	May	9	25.6	17,200				
1912	May	24	78.2	21,200				
1913	June	1	81.72	33,600				
1914	Apr.	19	77.6	19,600				
1915	May	23	74.6	11,500				
1916	May	9	80.25	28,400				
1917	May	17	83.8	41,900				
1918	Jan.	4	83.50	39,600				
1919	May	1	79.41	24,600				
1920	May	20	77.32	18,200				
1921	May	21	79.8	26,200				
1922	May	22	25.3	26,300				
1923	May	13	24.49	22,000				
1924	May	17	23.6	17,800				
1925	Apr.	20	26.30	31,700				
1926	Apr.	22	23.07	p15,800				
1927	May	20	25.7	28,200				
1928	May	15	25.38	26,600				
1929	May	25	22.80	14,700				
1930	Apr.	17	22.26	p12,900				
1931	Apr.	15	23.14	15,800				
1932	May	15	26.75	33,500				
1933	May	1	25.9	28,500				
1933	Dec.	26	29.75	47,800				
1935	May	10	25.38	25,400				
1936	Apr.	27	27.1	33,700				
1937	May	10	24.8	22,100				
1938	Apr.	22	26.86	32,700				
1939	May	5	25.0	23,300				
1940	Apr.	17	23.53	p16,500				
1941	May	19	23.44	p16,100				

SPOKANE RIVER BASIN  
Spokane River at Spokane, Wash.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1942	May	26	23.97	p18,400				
1943	Apr.	22	27.04	32,400				
1944	Apr.	15	22.10	p11,400				
1945	May	11	25.03	22,800				
1946	May	10	26.17	28,400				
1946	Dec.	18	25.48	25,000				
1948	May	31	28.34	39,600				
Period				Mean annual				

p Affected by regulation.

## St. Joe River at Calder, Idaho

Location.- Lat. 47°16', long. 116°11', 150 feet southwest of Chicago, Milwaukee, St. Paul & Pacific Railway station at Calder. April 1911 to September 1912 at site 2½ miles downstream.

Drainage area.- 1,080 square miles.

Records available.- April 1911 to September 1912, July 1920 to September 1948.

Gage.- Non-recording gage read once daily 1911-12. Recording gage thereafter. Datum of recording gage is about 2,100 feet above mean sea level.

Stage-discharge relation.- Defined by current-meter measurements below 22,000 second-feet.

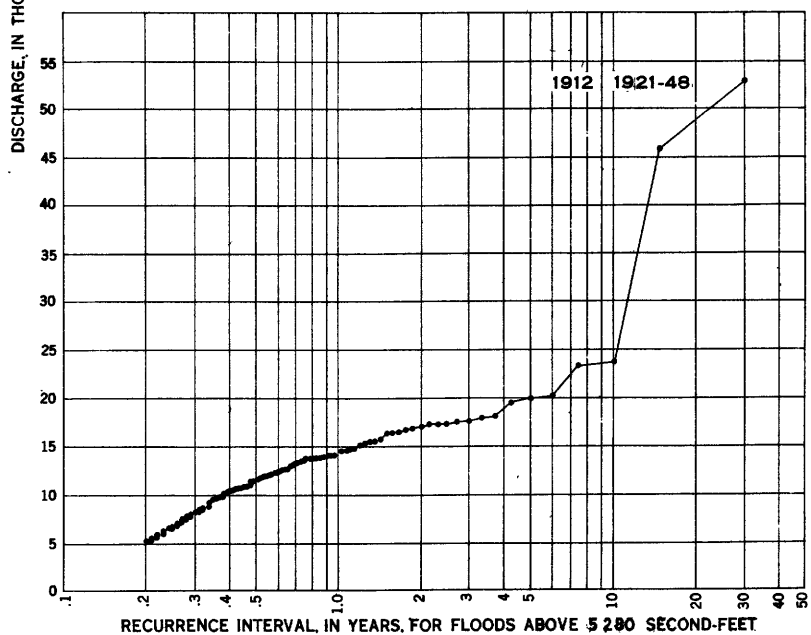
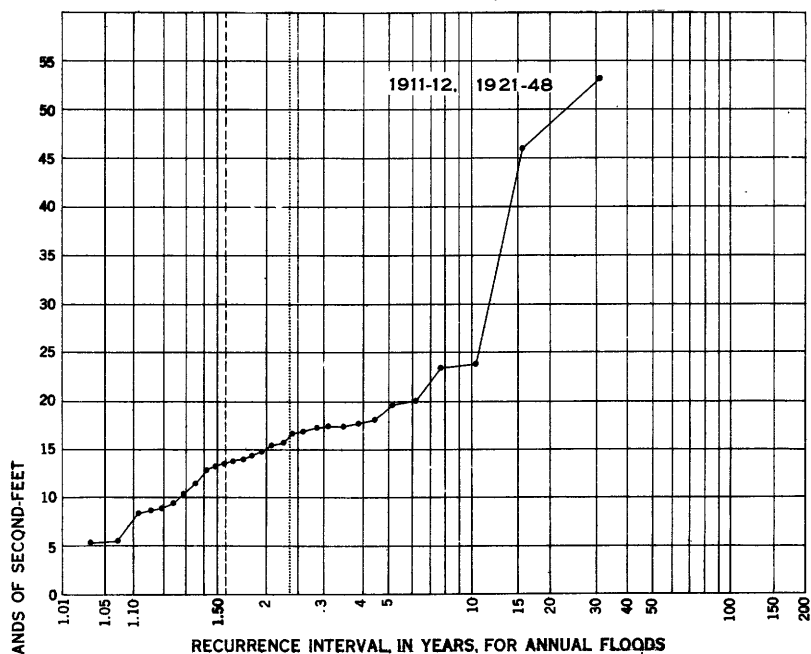
Maximum flood of record.- 53,000 second-feet Dec. 23, 1933, computed on basis of slope between gages downstream.

Remarks.- No diversion above station. Some regulation on upstream tributaries for logging operations. Gage heights for period when non-recording gage was used are from graphs based on gage readings. Numerous shifts in stage-discharge relation due to log jams and channel changes.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1911	Apr.	25	8.1	12,600	17	1.82		
	May	6	8.7	14,400				
	June	18	6.82	8,660				
1912	June	2	6.82	8,660	14	2.21		
	Apr.	3	5.6	5,520			145	0.21
	May	12	6.83	8,660			93	.32
		30	6.4	7,540			109	.28
		10	8.4	13,500			41	.73
		16	8.7	14,400			30	1.00
		21	9.1	15,700			22	1.36
		27	7.6	11,000			64	.47
1920	Dec.	30	85.40	10,600	9	3.45	73	.41
1921	Feb.	13	83.45	5,350			148	.20
	Mar.	5	83.50	5,450			147	.20
		18	86.06	12,700			46	.65
1921	Apr.	13	84.50	7,900			106	.28
		22	85.50	10,900			66	.45
	May	8	87.52	17,400			12	2.50
1921		16	87.46	17,400			13	2.31
	Dec.	1	83.50	5,540			144	.21
1922		13	85.35	10,500			75	.40
	Apr.	22	83.76	6,220			132	.23
1922		27	83.96	6,700			123	.24
	May	5	85.48	10,800	8	3.88	68	.44
		18	87.77	17,600			11	2.73
1922	June	5	86.07	12,000			55	.55
1923	Jan.	8	84.19	6,540	19	1.63	125	.24
	Apr.	2	84.56	7,560			108	.28
		18	86.14	12,000			56	.54
1923		28	85.83	11,100			63	.48
	May	9	86.60	13,600			40	.75
		26	85.50	10,200			78	.38
1923	June	10	85.03	8,700			91	.33
1924	Apr.	13	84.20	6,540	21	1.48	126	.24
	May	3	86.16	12,300			52	.58
		13	86.45	13,100			44	.68

## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

St. Joe River at Calder, Idaho



SPOKANE RIVER BASIN  
St. Joe River at Calder, Idaho--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1924	Dec.	14	84.16	6,800			120	0.25
1925	Feb.	4	90.2	e17,000			16	1.88
	Apr.	12	87.38	17,200	11	2.82	15	2.00
		17	87.17	16,600			18	1.67
	May	7	86.37	13,800			36	.83
		21	86.53	14,100			31	.97
1926	Apr.	19	85.97	11,500	23	1.35	60	.50
		30	84.90	8,330			98	.31
1926	Nov.	25	83.75	5,630			142	.21
		29	84.86	8,330			99	.30
	Dec.	2	85.66	10,600			74	.41
1927	Apr.	28	87.92	17,700	7	4.43	10	3.00
	May	16	87.95	18,000			9	3.33
	June	9	86.76	14,000			34	.88
1927	Nov.	7	85.84	10,900			67	.45
		25	87.03	14,600			28	1.07
	Dec.	3	85.60	10,300			77	.39
1928	Jan.	12	89.09	e11,500			61	.49
	Mar.	23	84.55	7,530			110	.27
	Apr.	1	84.01	6,060			133	.23
		28	86.50	13,000			45	.67
	May	8	87.47	16,600	13	2.38	19	1.58
1929	Mar.	29	83.74	5,570			143	.21
	Apr.	23	83.94	6,010			135	.22
		29	84.92	8,510			95	.32
	May	22	85.22	9,360	25	1.24	87	.34
1930	Apr.	8	84.43	7,450			111	.27
		15	84.83	8,510	27	1.15	96	.31
		24	84.70	8,240			100	.30
	May	3	84.10	6,710			121	.25
1931	Apr.	8	84.09	6,470			130	.23
	May	3	85.00	8,790	26	1.19	90	.33
		15	84.50	7,450			112	.27
1932	Feb.	27	86.05	12,100			53	.57
	Mar.	19	83.76	6,010			136	.22
	Apr.	3	84.32	7,200			114	.26
		14	86.63	14,100			32	.94
	May	5	87.33	16,600			20	1.50
		14	87.48	17,400	10	3.10	14	2.14
		22	86.85	14,800			26	1.15
1932	Dec.	3	84.07	6,710			122	.25
1933	Apr.	28	87.19	15,900			21	1.43
	May	15	85.39	9,940			80	.38
		27	86.48	13,400			42	.71
	June	9	88.23	19,600	6	5.17	7	4.28
1933	Oct.	29	84.81	7,970			105	.29
	Nov.	3	86.78	14,100			33	.91
	Dec.	11	87.85	18,200			8	3.75
1934		23	92.5	53,000	1	31.0	1	30.0
	Jan.	4	86.36	12,400			50	.60
		23	86.25	12,100			54	.56
	Mar.	16	84.47	6,950			117	.26
		29	88.43	20,200			5	6.00
	Apr.	14	86.49	11,800			58	.52
		24	86.32	11,500			62	.48
1935	Mar.	14	84.13	5,760			138	.22
	Apr.	16	85.73	9,660			84	.36
		21	86.08	10,700			72	.42
		27	85.74	9,660			83	.36
	May	6	86.71	12,700			47	.64
		23	86.90	13,400	20	1.55	43	.70
1936	Apr.	18	88.65	20,000	5	6.20	6	5.00
	May	5	87.00	13,800			37	.81
		12	86.53	12,000			57	.53

SPOKANE RIVER BASIN  
St. Joe River at Calder, Idaho--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-foot)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1937	Apr.	15	85.20	8,140	22	1.41	102	0.29
		21	85.20	8,140			103	.29
		27	84.87	7,150			115	.26
	May	4	86.68	12,700			48	.62
		15	86.14	10,700			71	.42
		26	85.34	8,400			97	.31
1938	Apr.	18	93.2	46,000	2	15.5	2	15.0
	May	1	86.80	13,800			38	.79
		16	85.54	9,800			82	.37
		26	85.98	11,000			65	.46
1939	Mar.	26	84.51	6,480	18	1.72	128	.23
	Apr.	3	84.42	6,480			129	.23
		22	86.03	10,700			70	.43
		30	86.90	13,800			39	.77
1940	Mar.	27	84.26	6,060	28	1.11	134	.22
	Apr.	15	84.68	6,920			119	.25
		20	84.70	6,920			118	.25
	May	3	84.82	7,150			116	.26
		11	85.21	8,140			104	.29
	1941	May	18	83.86			5,280	30
1941	Dec.	3	85.99	10,400	24	1.29	76	.40
1942	Apr.	14	85.76	10,100			79	.38
		22	85.60	9,510	85	.35		
1942	Nov.	24	84.11	5,660	16	1.94	139	.22
1943	Mar.	28	84.50	6,270			131	.23
	Apr.	2	84.69	6,700			124	.24
8		84.94	7,390	113			.27	
16		87.33	14,800	27			1.11	
May	2	85.76	9,510	86			.35	
	26	86.69	12,400	51			.59	
June	10	85.10	7,880	107			.28	
	19	85.47	8,670	92			.33	
1944	May	7	83.96	5,280	29	1.07	150	.20
		16	84.04	5,470			146	.21
1945	Jan.	13	84.14	5,660	15	2.07	140	.21
	May	5	87.53	15,500			24	1.25
1945	Dec.	29	84.52	6,520	4	7.75	127	.24
1946	Apr.	20	87.04	13,900			35	.86
		26	87.40	15,200			25	1.20
	May	6	87.22	14,600			29	1.03
		18	85.82	9,860			81	.37
1946	Dec.	11	85.56	9,110	4	7.75	88	.34
		15	88.98	23,400			4	7.50
1947	Mar.	22	84.03	5,660	12	2.58	141	.21
	Apr.	20	85.14	8,170			101	.30
	May	8	87.54	16,800			17	1.76
	June	9	84.10	5,800			137	.22
1948	Jan.	7	85.38	8,620	3	10.3	94	.32
	Apr.	18	86.13	10,800			69	.43
		22	87.37	15,700			23	1.30
		30	85.46	8,830			89	.34
	May	8	86.40	11,800			59	.51
		14	86.57	12,500			49	.61
		28	89.04	23,700			3	10.0
Period 1911-12, 1921-48				16,700	Mean annual			

\* Estimated; stage-discharge relation affected by ice.

## OKANOGAN RIVER BASIN

Okanogan River near Tonasket, Wash.  
(International gaging station)  
(Formerly called Okanogan River at Okanogan)

Location.- Lat. 48°38'00", long. 119°27'50", 1,000 feet upstream from Chewiliken Creek and 5½ miles south of Tonasket. Prior to Oct. 1, 1925, at site, at Okanogan, a quarter of a mile upstream from Salmon Creek, several miles below present site.

Drainage area.- 7,250 square miles; 7,740 square miles at former site.

Records available.- April 1929 to September 1948. May 1911 to September 1925, equivalent records at site at Okanogan, a quarter of a mile upstream from Salmon Creek (published as Okanogan River at Okanogan).

Gage.- Non-recording gage read twice daily to June 1916; once daily thereafter to September 1925. Recording gage April 1929 to September 1948.

Stage-discharge relation.- Defined by current-meter measurements.

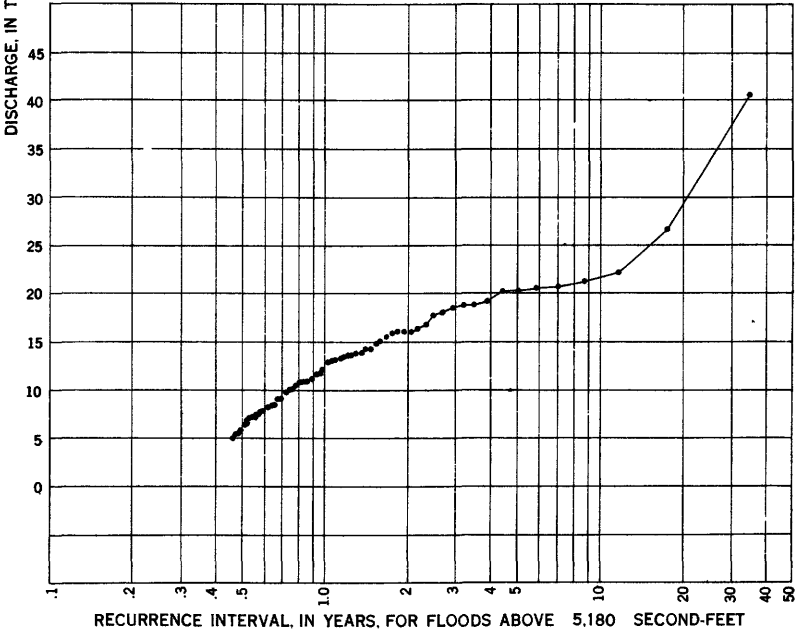
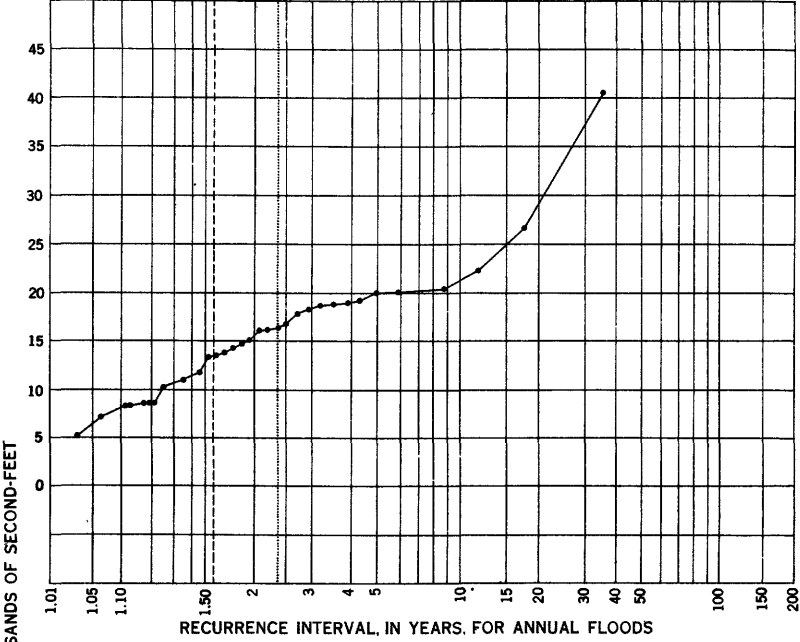
Maximum flood of record.- 40,500 second-feet May 31, 1948.

Remarks.- Many diversions above station for irrigation. Flow subject to natural regulation by several lakes and to some artificial regulation by Okanogan Lake as an aid to navigation. Gage-heights for period when non-recording gage was used are from graphs based on gage readings. Stage-discharge relation shifts frequently. This station is one of the international gaging stations maintained by the United States under agreement with Canada.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1912	May	22	9.62	13,700	21	1.67	28	1.25
1913	June	5	11.20	18,800	10	3.50	11	3.18
1914	May	18	9.80	14,300	20	1.75	24	1.46
		4	9.30	12,800			35	1.00
		18	8.71	11,000			41	.85
1915	May	26	6.98	7,220	33	1.06	66	.53
1916	May	8	9.81	14,300	3	11.7	25	1.40
		20	12.22	22,200			3	11.7
1917	May	15	7.20	7,350	15	2.33	64	.55
		31	11.20	16,200			17	2.06
		18	11.28	16,500			16	2.19
1918	Jan.	3	6.20	5,600	16	2.19	74	.47
		6	9.27	11,700			38	.92
		16	9.80	12,900			34	1.03
		1	9.10	11,300			39	.90
1919	May	15	11.18	16,200	11	3.18	18	1.94
		2	7.90	8,520			53	.66
		30	12.27	18,700			12	2.92
1920	June	23	10.31	13,900	26	1.35	26	1.35
		18	7.75	8,150			58	.60
		19	8.00	11,000			42	.83
1921	May	2	7.66	10,200	5	7.00	46	.76
		27	12.10	20,100			8	4.38
		9	12.44	20,800			5	7.00
1922	May	20	9.45	13,900	6	5.84	27	1.30
		7	12.50	20,600			6	5.84
1923	Apr.	30	5.76	5,820	17	2.06	71	.49
		24	8.67	12,000			36	.97
		12	10.43	16,200			19	1.84
1924	May	20	10.94	17,800	13	2.70	14	2.50
1924	Dec.	15	5.57	5,470	8	4.38	75	.47
1925	Apr.	14	5.67	5,640			73	.48
		22	11.38	19,200			9	3.89
1929	May	25	10.14	8,310	29	1.21	56	.62
		10	10.16	8,500			54	.65
1930	Apr.	25	9.10	6,460	31	1.13	69	.51
		18	9.89	7,930			59	.59
		9	10.06	8,310			57	.61
1931	May	4	9.75	7,720	30	1.17	61	.57
		16	10.23	8,480			55	.64



Okanogan River near Tonasket, Wash., 1912-25, 1929-48



OKANOGAN RIVER BASIN  
Okanogan River near Tonasket, Wash.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1932	Feb.	29	9.83	7,640	27	1.30	62	0.56
	May	12	11.52	10,600			45	.78
	June	15	10.80	9,340			50	.70
1933	May	1	9.33	6,790	7	5.00	67	.52
	June	7	13.47	15,600			21	1.67
		18	15.37	20,200			7	5.00
1933	Oct.	29	8.84	5,940	2	17.5	70	.50
1934	Apr.	27	18.31	26,600			2	17.5
	May	17	13.36	13,700			29	1.21
		31	13.06	13,100			32	1.09
1935	June	2	14.08	14,900	19	1.84	23	1.52
1936	May	6	11.61	9,800	24	1.46	49	.72
		16	12.60	11,800			37	.95
	June	4	12.18	11,000			43	.81
1937	June	5	14.16	15,100	18	1.94	22	1.59
1938	May	2	11.77	10,000	4	8.75	48	.73
		28	16.51	21,400			4	8.75
1939	May	17	12.35	11,200	25	1.40	40	.88
		30	11.39	9,210			52	.67
1940	May	12	10.12	6,640	32	1.09	68	.52
		26	10.61	7,540			63	.56
1941	May	3	9.81	5,180	34	1.03	76	.46
1942	Apr.	23	10.07	5,780	9	3.89	72	.49
	May	28	15.78	18,900			10	3.50
1943	Apr.	21	10.18	7,280	22	1.59	65	.54
	May	28	13.18	13,100			33	1.06
	June	11	13.41	13,500			30	1.17
1944	May	17	12.29	7,890	28	1.25	60	.58
	June	3	13.43	10,200			47	.74
		16	12.36	9,220			51	.69
1945	June	2	15.74	18,200	12	2.92	13	2.69
1946	May	13	14.72	16,000	14	2.50	20	1.75
		29	15.12	16,900			15	2.33
1947	May	10	13.47	13,400	23	1.52	31	1.13
		29	12.29	11,000			44	.80
1948	May	31	21.79	40,500	1	35.0	1	35.0
Period 1912-25, 1929-48				15,720	Mean annual			

m Provisional, subject to revision.

Similkameen River near Nighthawk, Wash.

(International gaging station)

(Formerly called Similkameen River near Oroville)

Location.- Lat. 48°59'10", long. 119°37'00", about 1½ miles downstream from Nighthawk and 12 miles upstream from mouth. Prior to Oct. 1, 1928, at Okanogan Valley Power Co's plant, 4 miles upstream from Oroville and about 8 miles downstream from Nighthawk.

Drainage area.- 3,420 square miles; 3,450 square miles at former site.

Records available.- September 1928 to September 1948. May 1911 to September 1928 at site 4 miles upstream from Oroville (published as Similkameen River near Oroville); records equivalent if flow in Oroville-Tonasket Irrigation District canal is included.

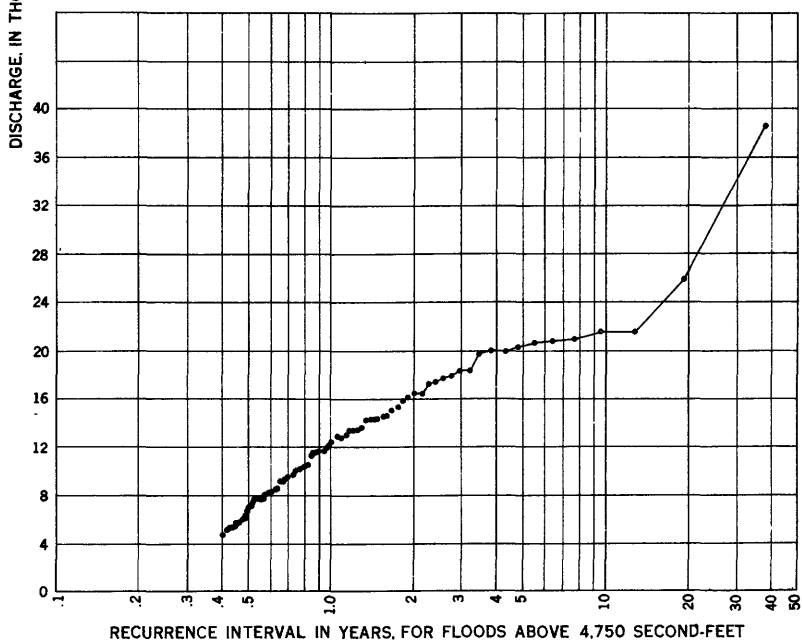
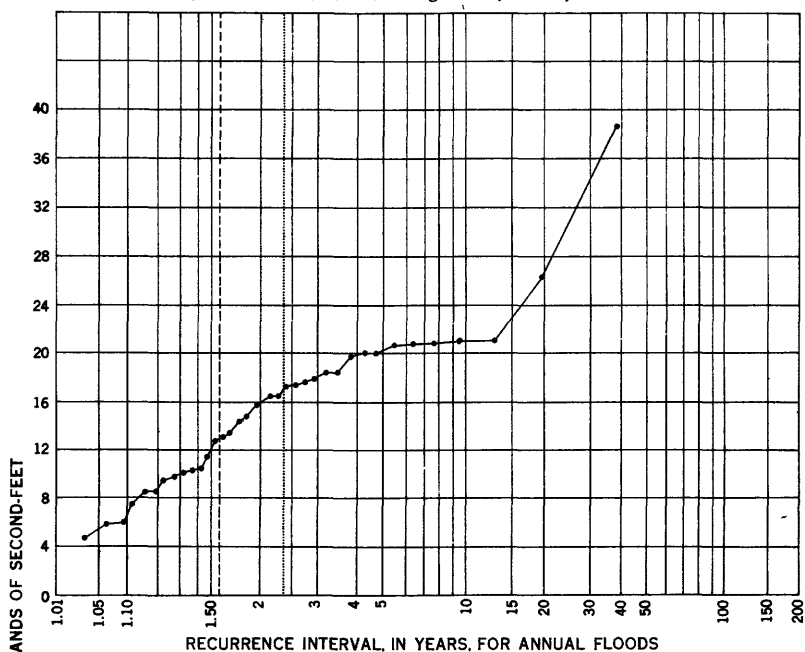
Gage.- Non-recording gage read twice daily prior to Oct. 1, 1928, recording gage thereafter. Datum of gage at mean sea level Mar. 4, 1924, to Sept. 30, 1928. Datum of gage prior to and subsequent to this period not known.

Stage-discharge relation.- Defined by current-meter measurements below 36,100 second-feet.

Maximum flood of record.- 38,600 second-feet May 30, 1948.

Remarks.- Oroville-Tonasket Irrigation District canal diverts water at a point three-quarters of a mile downstream from gage near Nighthawk and about 6 miles upstream from former site near Oroville. Diversion, which began in April 1916, is small part of total flow. Some regulation at high stage caused by natural diversion into and release from Palmer Lake. Gage heights for period when non-recording gage was used are from graphs based on gage readings. This station is one of the international gaging stations maintained by the United States under agreement with Canada.

Similkameen River near Nighthawk, Wash., 1912-48



OKANOGAN RIVER BASIN  
Similkameen River near Nighthawk, Wash.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1912	May	16	13.18	12,100	25	1.52	39	0.97
		22	13.73	12,800			35	1.09
1913	June	4	16.92	17,900	13	2.92	14	2.72
1914	May	3	10.46	8,200	24	1.58	65	.58
		17	13.80	13,000			34	1.12
	June	3	12.90	11,600			41	.93
		17	11.70	9,880			52	.73
1915	Apr. May	20	7.56	4,750	35	1.09	93	.41
		30	8.70	5,920			82	.46
1916	May June	6	13.70	12,800	7	5.43	36	1.05
		19	18.30	20,600			7	5.43
1917	May	14	9.25	6,980	17	2.24	76	.50
		29	15.70	16,400			18	2.11
	June	9	14.38	14,300			26	1.46
		17	14.88	15,100			23	1.65
1918	Jan. May	2	7.62	5,160	16	2.38	92	.41
		5	12.80	11,900			40	.95
	June	16	13.86	13,600			30	1.27
		31	11.67	10,300			48	.79
		14	16.20	17,200			17	2.24
1919	May June	2	9.80	7,740	10	3.80	71	.54
		28	17.84	19,800			11	3.46
		21	13.09	12,400			38	1.00
1920	May June July	18	9.96	7,750	27	1.41	68	.56
		22	11.87	10,400			47	.81
		2	11.35	9,700			54	.70
1921	May June	26	18.23	20,800	5	7.60	5	7.60
		8	18.00	20,400			8	4.75
1922	May June	19	14.70	14,200	3	12.7	29	1.31
		5	18.54	21,400			3	12.7
1923	Apr. May	28	8.80	5,310	18	2.11	91	.42
		10	13.20	11,600			43	.88
	June July	23	13.25	11,600			42	.90
		10	15.80	16,200			19	2.00
		8	10.30	7,240			75	.51
1924	May June	4	971.85	5,580	11	3.45	87	.44
		17	979.33	18,300			12	3.17
		3	973.32	7,680			72	.53
1924	Dec.	14	971.90	5,710	12	3.17	85	.45
1925	Apr. May	13	971.58	5,320			89	.43
		21	979.32	18,300			13	2.92
1926	Apr.	20	971.60	5,320	36	1.06	90	.42
		30	972.05	5,840			83	.46
1927	May June	18	973.68	8,320	15	2.53	64	.59
		25	973.33	7,680			73	.52
		9	978.84	17,300			16	2.38
1928	Apr. May	28	971.91	5,710	6	6.33	86	.44
		23	980.56	20,700			6	6.33
1929	May June	23	9.14	8,500	32	1.19	61	.62
		9	8.94	8,100			66	.58

OKANOGAN RIVER BASIN  
Similkameen River near Nighthawk, Wash.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1930	Apr.	24	8.26	6,930			77	0.49
	May	17	8.93	8,100			67	.57
	June	8	9.08	8,500	33	1.15	62	.61
1931	May	3	9.05	8,330			63	.60
		15	9.49	9,380	31	1.22	55	.69
	June	1	7.51	5,370			88	.43
1932	Feb.	28	9.22	8,590			60	.63
	May	11	10.0	10,200	28	1.36	50	.76
	June	14	9.46	9,190			59	.64
1933	Apr.	29	8.01	6,210			80	.48
	June	7	11.45	14,600			24	1.58
		17	13.30	20,000	8	4.75	9	4.22
1933	Oct.	29	7.78	5,830			84	.45
1934	Apr.	26	14.96	25,800	2	19.0	2	19.0
	May	16	11.00	13,400			31	1.23
		30	10.77	12,800			37	1.03
1935	May	31	11.42	14,600	21	1.81	25	1.52
	June	7	11.29	14,300			27	1.41
	July	2	8.19	6,600			78	.49
1936	May	5	9.50	9,310			56	.68
		15	10.34	11,400	26	1.46	46	.83
	June	3	9.91	10,300			49	.78
1937	June	4	11.90	16,100	19	2.00	20	1.90
1938	May	1	9.50	9,310			57	.67
		27	13.60	21,400	4	9.50	4	9.50
1939	May	16		k10,000	29	1.31	51	.74
		29	9.52	9,310			58	.66
1940	May	25	8.74	7,550	34	1.12	74	.51
1941	May	2	7.21	4,750			95	.40
	June	8	7.23	4,750	37	1.03	94	.40
1942	Apr.	22	7.20	4,750			96	.40
	May	27	13.09	20,000	9	4.22	10	3.80
1943	Apr.	20	8.13	6,340			79	.48
	May	27	11.11	13,400			33	1.15
	June	10	11.14	13,400	23	1.65	32	1.19
1944	May	16	8.77	7,750			69	.55
	June	2	9.72	9,740	30	1.27	53	.72
1945	June	1	12.40	17,600	14	2.72	15	2.54
1946	Apr.	27	7.91	5,960			81	.47
	May	12	11.69	15,300			22	1.73
		28	11.93	15,900	20	1.90	21	1.81
	June	15	10.38	11,500			44	.86
1947	Apr.	29	8.81	7,750			70	.54
	May	9	11.43	14,300	22	1.73	28	1.36
		27	10.43	11,500			45	.84
1948	May	30	17.62	m38,600	1	38.0	1	38.0
Period 1912-48				15,400	Mean annual			

k Estimated.

m Provisional, subject to revision.

## METHOW RIVER BASIN

Methow River at Twisp, Wash.

Location.- Lat. 48°21'40", long. 120°06'50", at highway bridge at Twisp, a quarter of a mile downstream from Twisp River.

Drainage area.- 1,330 square miles.

Records available.- June 1919 to September 1929, October 1933 to September 1948.

Gage.- Non-recording gage read twice daily prior to Aug. 1, 1922, once daily Aug. 1, 1922, to Sept. 30, 1929, Oct. 31 to Dec. 18, 1933. Recording gage Dec. 19, 1933, to Sept. 30, 1948.

Stage-discharge relation.- Defined by current-meter measurements below 10,100 second-feet and by slope-area measurement of peak discharge.

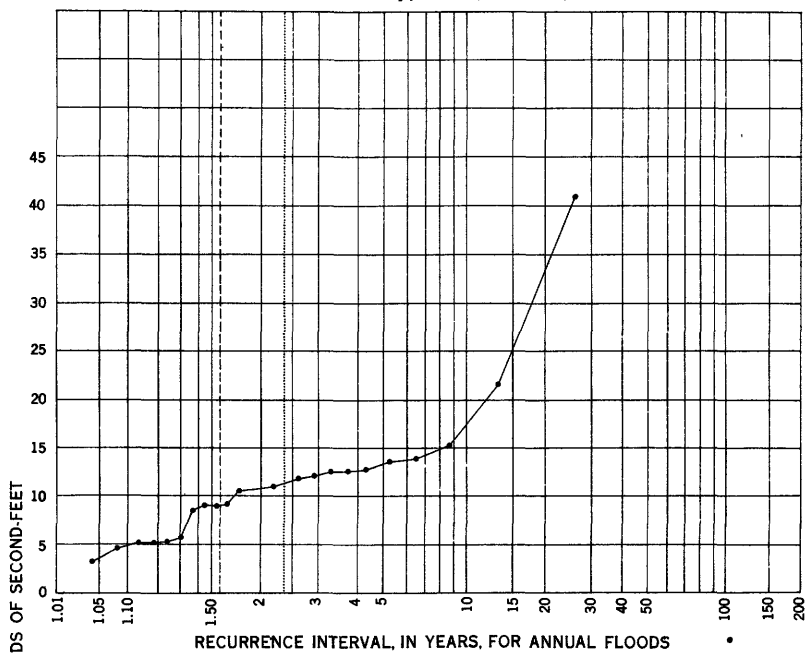
Maximum flood of record.- 40,600 second-feet May 29, 1948.

Remarks.- Water diverted above station for irrigation by two canals of Methow Valley Irrigation District, by Risley ditch, and by many other ditches. Gage heights for period when non-recording gage was used are from graphs based on gage readings.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1920	June	16	6.00	4,480	24	1.08	69	0.38
	July	1	5.90	4,320			70	.37
1921	May	22	9.93	12,300	4	6.50	8	3.25
	June	5	10.50	13,600			4	6.50
		22	7.20	6,630			43	.60
1922	May	18	8.60	9,470	6	4.33	24	1.08
	June	4	10.04	12,500			6	4.33
1923	May	1	5.30	3,360	19	1.37	87	.30
		10	7.60	7,410			37	.70
		22	7.20	6,630			44	.59
	June	9	8.10	8,420			32	.81
1924	May	16	9.21	10,800	12	2.16	15	1.73
	June	2	5.64	3,840			80	.32
1925	Apr.	12	5.63	3,840	11	3.36	81	.32
	May	20	9.47	11,400			14	1.86
	June	21	6.22	4,820			64	.41
		26	6.56	5,510			54	.48
1926	Apr.	30	5.10	3,050	25	1.04	93	.28
1927	May	17	6.34	5,190	7	3.72	59	.44
		25	5.27	3,500			86	.30
	June	8	9.92	12,400			7	3.72
1928	May	21	8.95	10,400	14	1.86	17	1.53
	June	13	5.10	3,200			99	.29
		23	4.98	3,050			94	.28
1929	May	23	6.25	5,010	23	1.13	61	.43
	June	8	6.16	5,010			62	.42
1934	Mar.	31	5.36	3,980	3	8.67	76	.34
	Apr.	14	7.41	8,350			33	.79
		24	10.02	15,200			3	8.67
	May	16	7.15	7,870			36	.72
		30	7.69	9,100			26	1.00
	June	9	6.41	6,070			47	.55
1935	May	9	5.65	4,540	15	1.73	68	.38
		23	7.78	9,580			22	1.18
		31	7.91	9,840			20	1.30
	June	7	8.06	10,400			18	1.44
	July	16	4.90	3,180			90	.29
1936	Apr.	24	5.32	3,890	9	2.89	78	.33
	May	5	5.40	4,070			74	.35
		15	6.07	5,360			56	.46
	June	3	8.72	12,000			10	2.60
1937		8	6.33	5,900	8	3.25	49	.53
	May	27	6.84	7,060			39	.67
	June	3	8.03	10,100			19	1.37
		11	7.31	8,300			34	.76
		17	8.76	12,300			9	2.89
		22	7.39	8,550			31	.84

## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

Methow River at Twisp, Wash., 1920-29, 1934-48



METHOW RIVER BASIN  
Methow River at Twisp, Wash.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-foot)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1938	May	1	6.48	6,180	5	5.20	46	0.56
		27	9.15	13,300			5	5.20
	June	8	7.80	9,560			23	1.13
		14	6.35	5,820			50	.52
		22	6.72	6,680			42	.62
1939	May	4	4.95	3,160	22	1.18	91	.29
		17	5.99	5,020			60	.43
		29	5.44	3,940			77	.34
1940	May	11	6.53	6,300	16	1.62	45	.58
		24	7.57	9,020			27	.96
	June	1	6.24	5,580			52	.50
		13	5.20	3,530			85	.31
1941	May	2	6.10	5,240	21	1.24	57	.46
		13	5.66	4,300			71	.37
		25	5.23	3,610			83	.31
	June	1	5.40	3,850			79	.33
		7	5.89	4,800			65	.40
		13	5.53	4,110			73	.36
1942	Apr.	22	5.22	3,590	2	13.0	84	.31
	May	26	10.76	21,300			2	13.0
	June	7	7.60	9,180			25	1.04
		15	6.17	5,430			55	.47
	July	1	5.27	3,680			82	.32
1943	Apr.	20	5.84	4,910	18	1.44	63	.41
	May	26	7.47	8,890			29	.90
	June	10	7.40	8,600			30	.87
		18	6.89	7,260			38	.68
	July	1	6.69	6,770			41	.63
1944	May	8	4.79	3,120	20	1.30	92	.28
		16	6.12	5,570			53	.49
	June	2	5.94	5,240			58	.45
		17	5.40	4,150			72	.36
1945	May	9	5.79	4,730	10	2.60	66	.39
		31	8.42	11,700			12	2.16
		21	6.34	6,010			48	.54
1946	Apr.	27	5.39	4,070	13	2.00	75	.34
	May	10	7.89	9,590			21	1.24
	June	28	8.29	10,700			16	1.62
		14	7.26	8,120			35	.74
	July	3	4.93	3,280			88	.30
1947	Apr.	19	4.80	3,050	17	1.53	95	.27
	May	29	5.69	4,660			67	.39
		8	7.72	8,920			28	.93
		28	6.81	6,940			40	.65
		9	6.15	5,680			51	.51
1948	May	29	12.96	40,600	1	26.0	1	26.0
	June	6	7.39	11,800			11	2.36
		17	7.27	11,500			13	2.00
Period 1920-29, 1934-48				11,300	Mean annual			

## CHELAN RIVER BASIN

Stehekin River at Stehekin, Wash.

Location.- Lat. 48°19'50", long. 120°41'40", 1,200 feet upstream from Boulder Creek and 2 miles upstream from Lake Chelan and Stehekin. Prior to Aug. 19, 1911, at site at Stehekin; Aug. 19, 1911, to Oct. 31, 1915, at site a quarter of a mile downstream from Boulder Creek.

Drainage area.- 372 square miles, including that of Boulder Creek.

Records available.- October 1910 to October 1915, January 1927 to September 1948. Flow of Boulder Creek included.

Gage.- Non-recording gage read once daily October 1910 to October 1915. Recording gage since January 1927.

Stage-discharge relation.- Defined by current-meter measurements below 8,980 second-feet and by slope-area measurement of peak discharge.

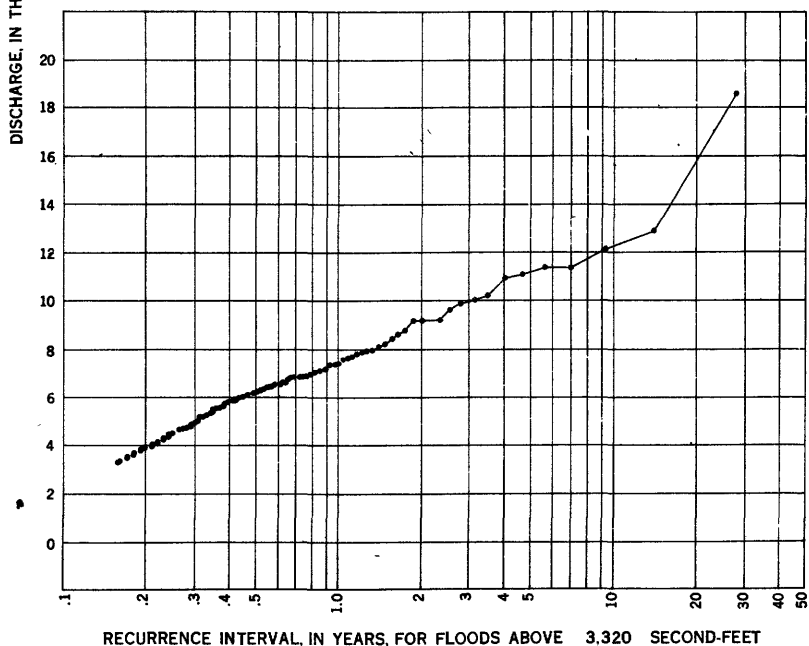
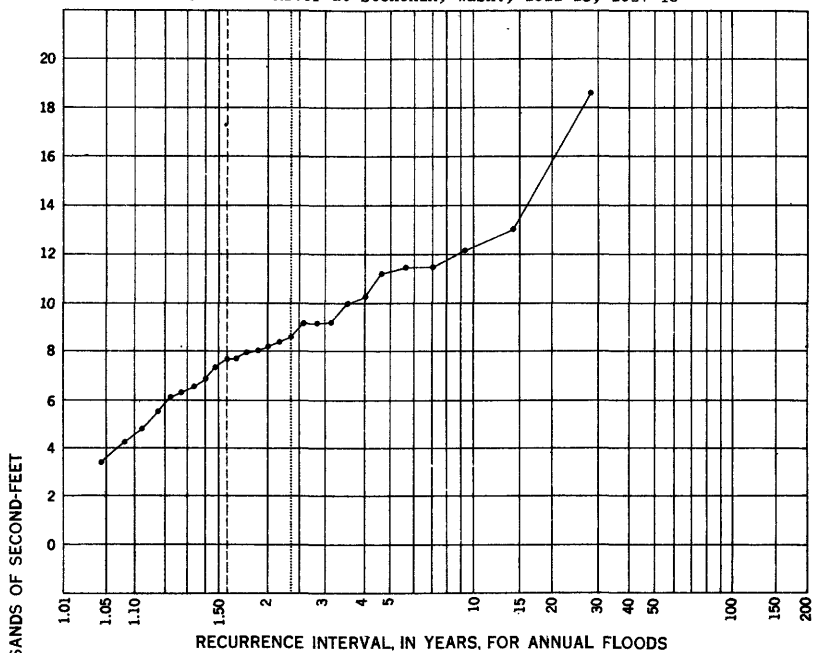
Maximum flood of record.- 18,800 second-feet May 29, 1948.

Remarks.- At very high stages small part of flow is diverted above gage by natural sloughs. Gage heights for period when non-recording gage was used are from graphs based on gage readings.



## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

Stehekin River at Stehekin, Wash., 1911-15, 1927-48



CHELAN RIVER BASIN  
Stehekin River at Stehekin, Wash.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-foot)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1911	Apr. May	25	3.3	4,360	4	7.00	117	0.24
		4	3.7	5,280			83	.34
		18	3.5*	4,800			97	.29
	June	1	5.2	9,190			12	2.33
		12	6.0	11,400			4	7.00
		22	4.0	5,430			80	.35
	July	5	3.3	3,830			145	.19
		16	3.9	5,190			87	.32
		25	3.1	3,390			171	.16
1912	May	14	5.40	6,420	20	1.40	50	.56
		20	5.65	6,860			37	.76
	June	13	5.15	5,980			64	.44
		19	5.55	6,860			38	.74
		25	5.46	6,640			45	.62
1913	May	10	4.10	3,820	21	1.33	146	.19
		25	5.40	6,420			51	.55
	July	28	3.8	3,330			73	.16
1914	May	2	4.30	4,110	22	1.27	125	.22
		23	5.14	5,620			74	.38
	June	2	5.40	6,230			55	.51
		17	5.37	6,230			58	.50
1915	July	3	4.88	5,220	27	1.04	85	.33
		9	3.85	3,320			174	.16
1927	Apr. May	27	22.60	3,650	6	4.87	155	.18
		17	23.98	6,080			60	.47
	24	22.61	3,650	158			.18	
	June	8	26.39	11,100			6	4.67
		22	24.30	6,310			54	.52
29	22.92	3,840	144	.19				
1927	Oct.	19	22.68	3,510	5	5.60	162	.17
	Dec.	2	22.96	3,920			137	.20
1928	May	22	26.62	11,400	23	1.22	5	5.60
		25	25.88	9,830			10	2.80
	June	5	22.72	3,510			163	.17
		12	23.26	4,440			115	.24
		23	24.04	5,850			67	.42
	July	3	22.65	3,430			169	.17
		Oct.	9	24.04			5,850	68
	1929	May June	23	24.13			6,050	25
8			23.98	5,850	69	.41		
15		23.47	4,800	98	.29			
24		22.74	3,590	159	.18			
1930	Apr. May	22	22.94	3,750	17	1.65	150	.19
		16	23.50	4,720			101	.28
	June	7	23.17	4,080			128	.22
		10	23.30	4,350			118	.24
		21	22.75	3,820			147	.19
	July	13	22.79	3,890			138	.20
1931	May	1	24.50	6,850	7	4.00	39	.72
		14	24.91	7,670			25	1.12
		31	24.16	6,000			63	.44
1931	June	8	24.18	6,000	17	1.65	62	.45
		16	23.32	4,350			119	.24
		26	23.20	4,180			124	.23
1932	Feb. May	27	26.11	10,200	7	4.00	8	3.50
		13	23.61	4,970			92	.30
		20	23.40	4,630			108	.26
	June	4	22.85	3,750			151	.19
		13	25.01	7,800			24	1.17
		21	24.15	6,120			59	.47
	Nov.	13	23.62	4,970			93	.30
		17	24.30	6,330			52	.54
1933	Apr. May	28	23.03	4,030	3	9.33	132	.21
		26	22.87	3,790			148	.19
	June	30	23.40	4,670			106	.26
		4	23.89	5,560			75	.37
	July	15	26.94	12,100			3	9.33
		2	23.86	5,560			76	.37
		8	23.98	5,750			72	.39
		16	24.40	6,570			46	.61
25	23.25	4,350	120	.23				

CHELAN RIVER BASIN  
Stehekin River at Stehekin, Wash.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-foot)	Annual floods		Partial duration series			
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)		
1933	Oct.	25	23.29	4,510	8	3.50	113	0.25		
		27	23.72	5,190			88	.36		
Nov.	2	22.82	3,710	154			.18			
	22	23.86	5,560	77			.36			
1934	Mar.	30	23.09	4,110			126	.22		
		8	23.04	4,020			133	.21		
Apr.	14	23.56	5,010	91			.31			
	24	26.02	10,000	9			3.11			
May	5	23.46	4,840	96			.29			
	15	24.14	5,950	65			.43			
June	29	25.14	8,050	20			1.40			
	11	24.17	6,150	57			.49			
July	6	22.64	3,470	166			.17			
	16	22.63	3,470	167			.17			
1934	Nov.	5	22.85	3,790			18	1.56	149	.19
1935	Jan.	26	24.65	6,990					35	.80
		6	22.63	3,470					168	.17
May	15	22.89	3,870	143					.20	
	22	24.48	6,780	43					.65	
June	31	24.36	6,570	47					.60	
	8	24.90	7,620	26					1.08	
July	22	23.45	4,670	107					.26	
	28	23.28	4,510	114					.25	
July	14	23.74	5,190	89					.32	
	1936	Apr.	19	23.57					5,130	90
4			23.41	4,770					100	.28
May	14	24.48	8,850	40					.70	
	31	25.84	9,590	11					2.55	
June	2	27.18	12,900	2					14.0	
	7	23.42	4,770	99					.28	
July	16	23.18	4,430	116					.24	
	23	23.00	4,100	127					.22	
1937	May	4	22.78	3,880					142	.20
		25	23.94	5,690					73	.38
June	3	25.56	9,150	13					.22	
	7	24.64	7,050	33					.85	
July	16	24.70	7,250	31					.90	
	21	24.43	6,650	44					.64	
July	28	24.46	6,850	41			.68			
	1937	Oct.	28	24.56			7,050	34	.82	
18			23.72	5,340			82	.34		
1938	Apr.	1	23.31	4,680			105	.27		
		24	25.39	8,720			16	1.75		
June	7	25.01	7,880	23			1.22			
	24	25.56	9,150	14			2.00			
July	8	22.57	3,480	164			.17			
	1939	May	3	22.56			3,480	165	.17	
16			24.48	6,850			42	.67		
June	29	25.60	9,150	15			1.87			
	13	22.62	3,560	160			.18			
July	22	22.58	3,560	161			.17			
	29	23.80	5,510	79			.35			
July	11	22.45	3,320	175			.16			
	1940	May	10	24.27			6,450	49	.57	
23			25.09	7,990			21	1.33		
June	31	23.81	5,560	78			.36			
	12	23.64	5,220	86			.33			
July	19	22.80	3,890	139			.20			
	25	22.48	3,420	170			.16			
1940	Oct.	19	22.97	4,210			26	1.08	122	.23
		2	22.69	3,730			152	.18		
1941	Apr.	1	22.82	3,890			140	.20		
		12	22.92	4,050			129	.22		
June	24	22.82	3,890	141			.20			
	12	22.92	4,050	130			.22			
1942	May	25	25.27	8,370			13	2.15	18	1.56
		6	23.46	4,890			94	.30		
July	15	23.43	4,720	102			.27			
	1	23.41	4,720	103			.27			

CHELAN RIVER BASIN  
Stehekin River at Stehekin, Wash.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series				
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)			
1943	Apr. May June	16	23.30	4,550	14	2.00	109	0.26			
		26	25.17	8,160			19	1.48			
		9	24.84	7,330			28	1.00			
	July	17	24.45	6,540			48	.58			
		30	24.80	7,330			29	.97			
		7	23.96	5,780			70	.40			
1944	May June	23	23.30	4,550	24	1.17	110	.25			
		15	23.66	5,420			81	.35			
		29	23.23	4,720			104	.27			
	June	11	23.12	4,550			111	.25			
		16	22.56	3,600			157	.18			
		1945	May June	6			23.48	4,890	12	2.33	95
31	25.36			8,590	17	1.65					
20	24.00			5,780	71	.39					
July	25		23.30	4,550	112	.25					
	10		22.70	3,600	158	.18					
	1945 1946		Oct. Apr. May	26	23.69	5,240	19	1.47			84
26		22.46		3,360	172	.16					
9		24.65		7,110	32	.87					
June		27	24.84	7,530	27	1.04					
		3	24.10	6,130	58	.48					
		14	24.02	5,940	66	.42					
July		20	24.47	6,910	36	.78					
		2	22.93	4,050	131	.21					
		11	22.68	3,730	153	.18					
20		22.84	3,970	134	.21						
1946 1947		Oct. Apr. May	25	24.16	6,320	16			1.75	53	.53
			28	22.86	3,970					135	.21
	8		25.00	7,960	22		1.27				
	June	28	24.70	7,320	30		.93				
		18	23.03	4,210	123		.23				
		25	22.85	3,970	136		.21				
1948	May June	29	29.00	18,600	1	28.0	1	28.0			
		7	26.25	10,900			7	4.00			
		29	22.88	4,320			121	.23			
Period 1911-15, 1927-48				8,603	Mean annual						

Railroad Creek at Lucerne, Wash.

Location.- Lat. 48°11'40", long. 120°35'50", half a mile upstream from mouth and half a mile southwest of Lucerne. Prior to July 1, 1913, at site just upstream from mouth.

Drainage area.- 64 square miles.

Records available.- December 1910 to June 1913, January 1927 to September 1948.

Gage.- Non-recording gage read once daily December 1910 to June 1913, July to September 1948. Recording gage January 1927 to May 1948.

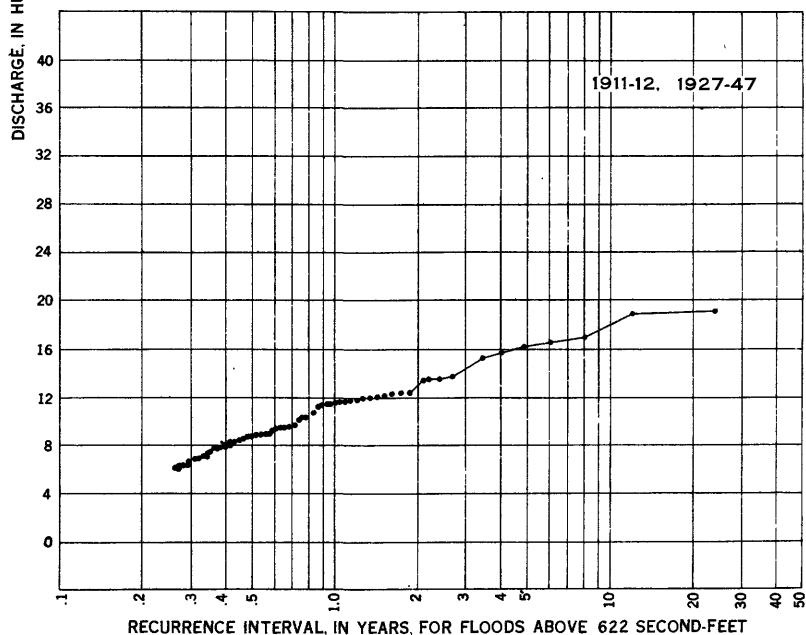
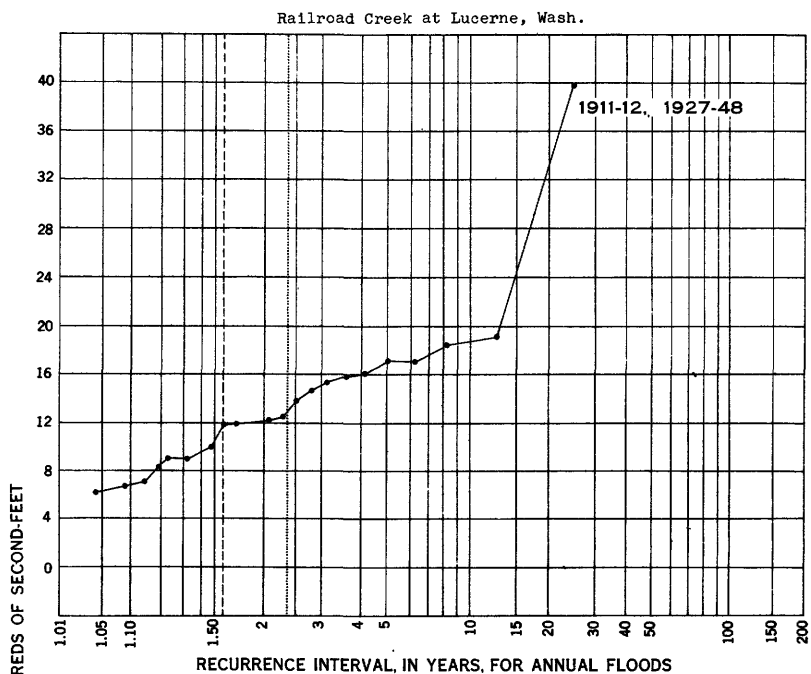
Stage-discharge relation.- Defined by current-meter measurements below 1,350 second-feet, and by slope-area measurement of peak discharge.

Maximum flood of record.- 3,880 second-feet May 28, 1948.

Remarks.- No diversion or regulation. Gage heights for period when non-recording gage was used are from graphs based on gage readings. Stage-discharge relation subject to frequent shifts.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1911	June	4	2.7	760	19	1.32	68	0.35
		13	3.0	900			42	.57
1912	May	20	3.0	900	20	1.25	43	.56
	June	12	2.8	806			60	.40
		25	2.82	806			61	.39
1927	May	17	4.64	824	2	12.5	58	.41
	June	8	5.32	1,910			1	24.0
		22	4.52	1,040			31	.77
1928	May	22	5.10	1,860	3	8.33	2	12.0
			4.66	1,360			10	2.40
	June	13	4.00	696			77	.31
		24	4.20	885			47	.51

## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN



CHELAN RIVER BASIN  
 Railroad Creek at Lucerne, Wash.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1929	May	24	4.30	981	17	1.47	34	0.71
		9	4.34	876			51	.47
		15	4.23	777			66	.36
1930	May	16	4.07	636	23	1.09	87	.28
		10	4.18	674			79	.30
1931	May	2	4.12	626	21	1.19	89	.27
		14	4.38	843			56	.43
	June	1	4.34	779			65	.37
		9	4.35	788			63	.38
		16	4.23	690			78	.31
		26	4.19	658			83	.29
1932	Feb.	27	4.46	884	18	1.39	49	.49
		13	4.16	636			88	.27
		14	4.54	956			39	.62
		23	4.45	884			50	.48
1932	Nov.	17	4.76	1,170			22	1.09
1933	May	30	4.19	716	9	2.78	73	.33
		4	4.46	970			35	.68
	July	15	4.95	1,460			8	3.00
		2	4.42	932			41	.58
		8	4.38	896			45	.53
		16	4.45	961			38	.63
1934	Apr.	25	4.01	624	7	3.57	90	.27
		15	4.00	730			71	.34
		24	4.75	1,580			6	4.00
	May	5	3.97	700			75	.32
		16	4.15	885			48	.50
		30	4.57	1,360			11	2.18
1935	June	9	4.27	1,020	12	2.08	33	.73
	Jan.	25	5.20	kl,150			25	.96
		22	4.16	896			46	.52
	May	31	4.22	962			37	.65
		8	4.45	1,220			16	1.50
1936	June	22		k660	12	2.08	82	.29
		28		k670			80	.30
	July	16	4.06	788			64	.38
1937	May	14	4.15	903	5	5.00	44	.55
		3	4.86	1,670			4	6.00
		8	4.07	729			72	.33
1938	May	26	4.13	710	10	2.50	74	.32
		3	4.60	1,250			13	1.85
		10	4.53	1,170			23	1.04
		17	4.59	1,380			9	2.67
		21	4.54	1,310			12	2.00
		29	4.47	1,220			17	1.41
1939	May	29	4.44	1,160	4	6.25	24	1.00
		8	4.50	1,240			15	1.60
		14	4.11	771			67	.36
		23	4.82	1,700			3	8.00
1940	May	16	4.06	859	13	1.92	54	.44
		29	4.34	1,200			18	1.33
		30	4.04	793			62	.39
1941	May	11	3.98	640	11	2.27	85	.28
		23	4.43	1,250			14	1.71
		31	4.18	862			52	.46
		13	4.18	862			53	.45
1942	June	13	3.87	622	24	1.04	91	.26
1943	May	25	4.68	1,620	6	4.17	5	4.80
		6	4.01	646			84	.29
		2	4.18	836			57	.42
1944	May	26	4.45	1,130	16	1.56	28	.86
		9	4.32	951			40	.60
		17	4.39	1,050			30	.80
		2	4.45	1,180			21	1.14
		7	4.19	848			55	.44
1945	May	15	4.06	698	22	1.14	76	.32
		11	3.96	666			81	.30

## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

CHELAN RIVER BASIN  
Railroad Creek at Lucerne, Wash.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1945	May	31	4.61	1,530	8	3.12	7	3.43
		20	4.25	1,080			29	.83
		26	3.91	640			86	.28
1946	May	10	4.15	815	15	1.67	59	.41
		28	4.46	1,190			20	1.20
	June	3	4.34	1,040			32	.75
		14	4.28	966			36	.67
		21	4.43	1,150			26	.92
1947	May	8	4.51	1,200	14	1.79	19	1.26
		27	4.33	1,140			27	.89
	June	9	4.00	750			69	.35
		18	3.99	740			70	.34
1948 <sup>f</sup>	May	28	8.1	3,880	1	25.0	-	-
Period 1911-12, 1927-48				1,350	Mean annual			

<sup>f</sup> Incomplete year.

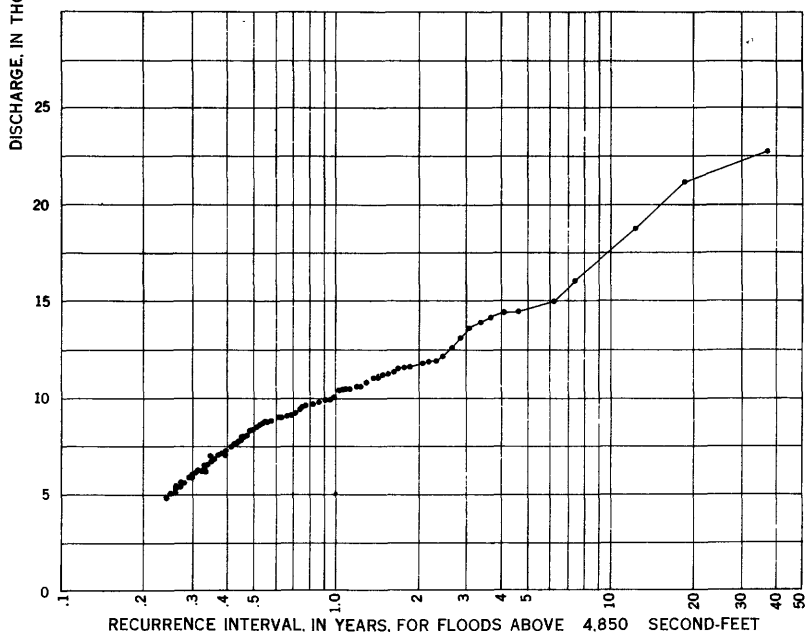
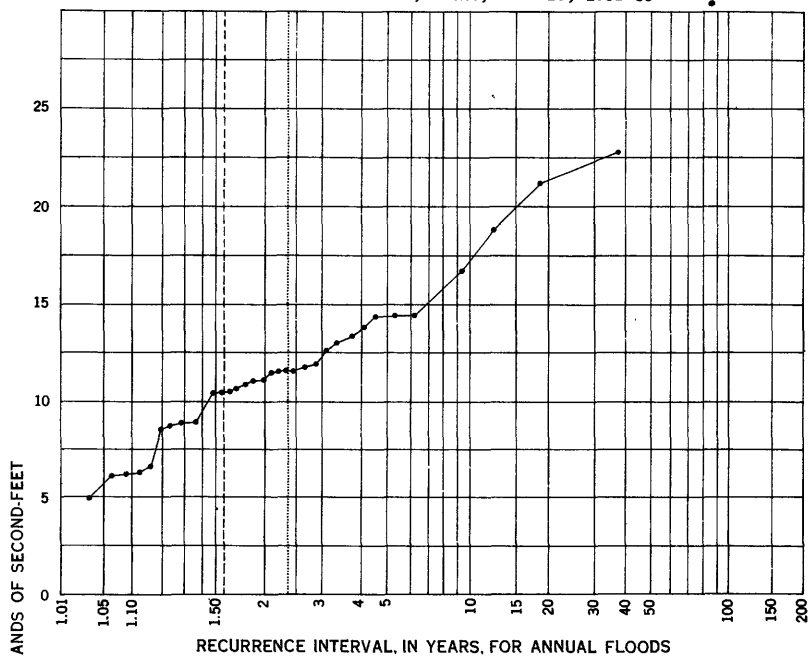
k: Estimated.

## WENATCHEE RIVER BASIN

Wenatchee River at Plain, Wash.  
(Formerly called Wenatchee River near Leavenworth)Location.- Lat. 47°45'50", long. 120°39'30", at Plain, a quarter of a mile downstream from Beaver Creek, 7½ miles downstream from Nason Creek, and 12 miles north of Leavenworth. Prior to Jan. 8, 1932, at site 1 mile downstream from Beaver Creek.Drainage area.- 591 square miles.Records available.- November 1910 to September 1948 (1923, 1926 partly estimated), including estimated monthly discharge for period October 1929 to July 1931.Gage.- Non-recording gage read once daily prior to Jan. 8, 1932, recording gage there-after. Datum of recording gage is 1,805 feet above mean sea level (from river-profile map).Stage-discharge relation.- Defined by current-meter measurements below 18,900 second-feet.Maximum flood of record.- 22,700 second-feet May 29, 1948.Remarks.- Wenatchee Park Land & Irrigation Co. diverts a maximum of about 12 second-feet from Chiwawa River during irrigation seasons. Natural regulation by Wenatchee Lake. Gage heights for period when non-recording gage was used are from graphs based on gage readings. Stage-discharge relation shifted frequently at former site.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series			
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)		
1911	May June	4	6.1	5,330	23	1.61	140	0.25		
		2	7.8	9,300			50	.70		
		14	8.2	10,400			32	1.09		
		27	6.0	4,900			150	.23		
1912	May	15	8.02	9,840	15	2.46	41	.85		
		21	8.62	11,500			19	1.84		
	June	9	7.72	9,030			56	.62		
		20	7.58	8,760			64	.55		
		27	7.27	7,970			77	.45		
1913	May June	10	7.67	7,600	6	6.17	87	.40		
		4	9.65	14,300			7	5.00		
	July	20	7.90	9,570			46	.76		
		7	6.97	7,200			91	.38		
		22	6.65	6,230			114	.31		
1914	Apr. May	20	6.79	5,700	28	1.32	128	.27		
		3	7.27	6,720			103	.34		
	June July	16	7.66	8,840			61	.57		
		3	7.30	7,760			85	.41		
		17	6.96	7,000			97	.36		
		3	6.09	4,900			151	.23		
1915	Apr.	3	6.56	6,020	34	1.09	117	.30		
		20	6.10	4,900			152	.23		
1916	May	5	8.00	9,680	4	9.25	43	.81		
		20	6.88	6,750			102	.34		
		28	7.00	7,000			98	.36		
	June	18	10.27	16,700			4	8.75		
		27	8.42	10,800			28	1.25		
		3	7.67	8,840			62	.56		
	July	10	7.82	9,120			54	.65		

Wenatchee River at Plain, Wash., 1911-29, 1932-48





WENATCHEE RIVER BASIN  
Wenatchee River at Plain, Wash.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1917	May	14	6.85	6,710	20	1.85	105	0.33
		30	8.42	11,000			27	1.30
	June	9	7.47	8,490			72	.49
		17	8.41	11,000			26	1.35
1917	July	4	7.89	9,570	3	12.3	47	.74
		19	7.64	8,760			65	.54
1918	Dec.	30	11.13	18,700	13	2.85	3	11.7
		5	7.30	7,970			78	.45
	May	15	6.52	6,000			120	.29
		31	6.49	6,000			121	.29
1918	June	14	8.60	11,500	13	2.85	20	1.75
		14	6.10	5,110			142	.25
1919	Dec.	1	6.67	6,470	32	1.15	108	.32
		28	8.67	11,800			16	2.19
	June	6	7.05	7,200			93	.38
		22	7.71	9,030			57	.61
1920	July	5	7.05	7,200	32	1.15	92	.38
		15	6.75	6,710			106	.33
1920	May	18	6.13	5,110	32	1.15	143	.24
		16	6.31	5,550			132	.26
1920	June	1	6.70	6,470	7	5.29	109	.32
		6	6.49	5,770			127	.28
	Oct.	12	6.50	5,770			126	.28
		19	8.70	11,800			17	2.06
1921	May	7	9.58	14,300	7	5.29	8	4.38
		25	7.54	8,490			73	.48
1921	Dec.	13	11.90	21,100	2	18.5	2	17.5
		18	9.47	14,000			10	3.50
1922	June	4	8.84	12,100	24	1.54	15	2.33
		10	8.15	10,400			-	-
1923	Feb.	12	8.30	11,300	11	3.37	23	1.52
		15	8.93	13,000			13	2.69
1924	May	3	6.63	6,780	12	3.08	101	.35
		14	7.34	7,970			79	.44
1925	Apr.	13	7.32	7,970	33	1.12	80	.44
		20	9.04	12,600			14	2.50
	June	21	7.30	7,970			81	.43
		29	6.5	6,200			-	-
1926	Oct.	17	5.94	4,990	5	7.41	147	.24
		27	6.19	5,590			131	.27
1927	Apr.	17	7.85	8,980			58	.60
		9	9.68	14,900			6	5.83
1927	June	22	7.55	8,980	8	4.62	59	.59
		3	6.30	5,800			124	.28
1928	Dec.	13	6.50	6,240	31	1.19	112	.31
		23	9.54	14,300			9	3.89
	May	12	6.32	5,800			123	.28
		26	6.48	6,240			113	.31
1929	June	24	7.37	8,460	21	1.76	74	.47
		9	6.63	6,470			110	.32
1932	Feb.	28	8.91	10,800	9	4.11	29	1.21
		14	7.32	7,570			88	.40
	May	15	8.50	9,990			37	.95
		23	7.24	7,380			90	.39
1932	Nov.	13	7.99	9,190	9	4.11	51	.69
		18	7.77	8,750			67	.52
1933	Dec.	3	6.37	6,020	9	4.11	118	.30
		29	6.38	6,020			119	.29
	Apr.	6	7.84	3,750			66	.53
		16	9.71	13,800			11	3.18
1933	July	16	7.56	8,330			75	.47

WENATCHEE RIVER BASIN  
Wenatchee River at Plain, Wash.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1933	Oct.	25	6.59	6,380			111	0.32
	Nov.	3	8.24	9,640			45	.78
	Dec.	13	5.79	4,960			148	.24
		23	8.41	10,100			36	.97
1934	Mar.	31	7.39	7,910			82	.43
	Apr.	24	9.59	13,500	10	3.70	12	2.92
	May	16	7.29	7,710			86	.41
		30	8.09	9,410			49	.71
	June	12	6.79	6,720			104	.34
1934	Nov.	6	6.07	5,430			136	.26
1935	Jan.	27	8.90	11,500	16	2.31	21	1.67
	May	9	6.26	5,790			125	.28
		23	7.76	8,750			68	.51
		31	7.75	8,750			69	.51
	June	8	8.48	10,400			33	1.06
		29	6.51	6,150			116	.30
	July	16	6.23	5,610			130	.27
1936	Apr.	23	6.97	7,000			99	.35
	May	5	7.42	7,790			84	.42
		15	8.58	10,600			30	11.7
	June	3	8.77	11,200	18	2.05	24	1.46
		24	6.08	5,310			141	.25
1937	May	4	6.16	5,480			133	.26
		27	7.05	7,100			96	.36
	June	3	8.58	10,600	22	1.68	31	1.13
		17	8.17	9,540			48	.73
		30	7.45	7,900			83	.42
1938	Apr.	18	7.80	8,650			71	.49
	May	1	7.06	7,110			95	.37
		26	8.97	11,700	14	2.64	18	1.94
	June	8	8.26	9,760			42	.83
		23	8.01	9,140			53	.66
1939	May	16	7.85	9,060	27	1.37	55	.64
		29	7.52	8,310			76	.46
	June	13	5.78	4,940			149	.23
		30	6.08	5,450			134	.26
1940	May	11	7.16	7,540			89	.39
		24	7.72	8,770	29	1.28	63	.56
		31	6.48	6,180			115	.30
	June	13	6.08	5,450			135	.26
1941	May	1	5.73	4,850	36	1.03	154	.23
1942	May	26	7.70	8,720	30	1.23	70	.50
	June	7	6.08	5,430			137	.26
		15	5.89	5,070			144	.24
1943	Apr.	16	6.99	7,200			94	.37
	May	26	8.71	11,200	19	1.95	25	1.40
	June	10	8.25	9,900			38	.92
		18	8.07	9,660			44	.80
	July	2	8.22	9,900			39	.90
1944	May	8	5.79	4,890			153	.23
		16	6.41	6,000	35	1.06	122	.29
		30	5.88	5,070			145	.24
1945	May	7	6.87	6,990			100	.35
		31	8.24	9,900	26	1.42	40	.88
	June	21	6.73	6,590			107	.33
1946	Apr.	26	5.87	5,070			146	.24
	May	27	8.79	11,400	17	2.18	22	1.59
	June	15	7.83	8,950			60	.58
		21	7.90	9,180			52	.67
	July	3	6.14	5,430			158	.25
1947	Apr.	20	6.12	5,430			139	.25
	May	8	8.40	10,400	25	1.48	34	1.03
		28	8.58	10,400			35	1.00
	June	18	6.17	5,620			129	.27
1948	May	29	12.43	22,700	1	37.0	1	35.0
	June	9	10.35	16,000			5	7.00
Period 1911-29, 1932-48				11,590	Mean annual			

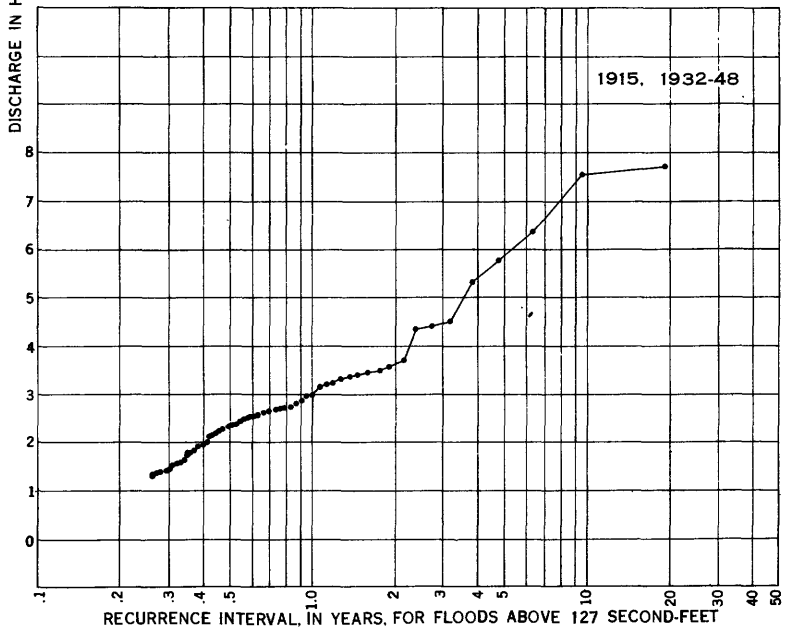
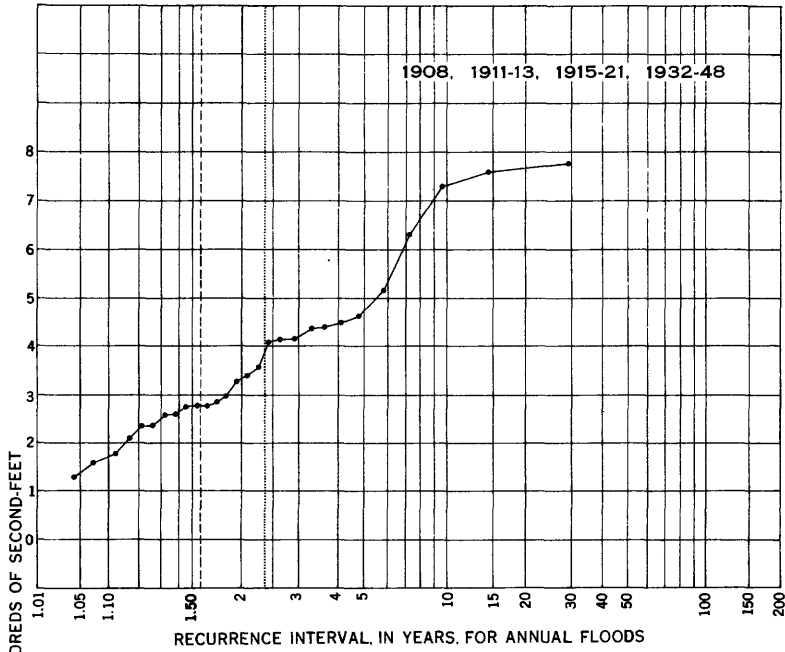
## YAKIMA RIVER BASIN

North Fork Ahtanum Creek near Tampico, Wash.

Location.- Lat. 46°33'40", long. 120°55'10", 100 feet downstream from Nasty Creek and 3½ miles northwest of Tampico.Drainage area.- 69 square miles.Records available.- August 1907 to September 1924 (fragmentary), March 1931 to September 1948.Gage.- Non-recording gage read once daily prior to Apr. 2, 1913, intermittently Aug. 20, 1915, to Sept. 5, 1916. Recording gage after Apr. 2, 1913, except for period August 1915 to September 1916. Gage datum changed Sept. 20, 1934.Stage-discharge relation.- Defined by current-meter measurements below 523 second-feet.Maximum flood of record.- 770 second-feet May 27, 1948.Remarks.- No diversion of importance. No regulation. Stage-discharge relation shifts frequently.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1908	June	11	2.90	407	12	2.42	-	-
1911	June	1	2.8	411	11	2.64	-	-
1912	May	20	3.20	629	4	7.25	-	-
1913	June	3	3.56	460	6	4.83	-	-
1915	Jan.	25	2.32	143	20	1.45	63	0.30
	Mar.	23	2.43	146			62	.31
	Apr.	2	3.00	272			24	.79
	19		2.81	228			40	.47
	May	9	2.66	195			48	.40
1916	June	18	4.60	728	3	9.67	-	-
1917	June	8	3.60	412	10	2.90	-	-
1918	June	10	3.13	275	18	1.61	-	-
1919	May	27	3.40	354	13	2.23	-	-
1920	May	8	2.92	208	25	1.16	-	-
1921	June	5	3.85	512	5	5.80	-	-
1932	Feb.	27	2.91	194	22	1.32	49	.39
	Mar.	18	2.68	142			65	.29
	Apr.	14	2.67	139			68	.28
	May	10	3.16	255			31	.61
	June	12	3.01	218			43	.44
1933	Apr.	27	3.35	316	9	3.22	18	1.06
	May	30	3.45	344			12	1.58
	4		3.47	350			11	1.73
	June	14	3.76	433			8	2.38
1933	Dec.	10	3.25	286	2	14.5	21	.90
	22		4.45	755			2	9.50
1934	Jan.	23	3.71	532			5	3.80
	Mar.	29	2.34	180			52	.37
	Apr.	24		250			34	.56
	May	28	2.24	160			56	.34
	Nov.	5	1.52	182			51	.37
1935	Dec.	21	1.27	136	17	1.71	70	.27
	Jan.	25	1.98	282			22	.86
	May	22	1.93	271			25	.76
1936	Apr.	22	1.78	237	16	1.81	37	.51
	May	4	1.86	255			32	.59
	14		2.05	298			19	1.00
	27		1.79	239			36	.53
	June	7	1.85	252			33	.58
1937	Apr.	14	1.71	221	19	1.53	42	.45
	May	3	1.80	241			35	.54
	27		1.90	264			28	.68
	June	3	1.94	273			23	.83
		21	1.68	215			44	.43

North Fork Ahtanum Creek near Tampico, Wash.



YAKIMA RIVER BASIN  
North Fork Ahtanum Creek near Tappico, Wash.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1938	Mar.	13		k140			67	0.28
	Apr.	18	2.21	356			10	1.90
	May	1	2.26	370			9	2.11
		15	2.15	340			13	1.46
		24	2.52	446			6	3.17
	June	7	2.12	331	7	4.14	15	1.27
1939	May	16	1.35	158	27	1.07	57	.33
		29	1.21	131			72	.26
1940	Mar.	24	1.19	127			73	.26
	Apr.	23	1.35	158			58	.33
	May	10	1.71	233	24	1.21	39	.49
1941	Apr.	1	1.47	173	26	1.12	55	.35
	May	1	1.38	156			60	.32
		12	1.29	139			69	.28
		24	1.27	136			71	.27
1942	Apr.	12	1.45	178			53	.36
		21	1.45	178			54	.35
	May	9	1.27	141			66	.29
		22	1.81	258			30	.63
1943	Nov.	23	1.33	153	21	1.38	61	.31
	Mar.	28	1.53	196			46	.41
	Apr.	19	1.91	298			20	.95
	May	25	1.96	339			14	1.36
	June	9	1.71	261	14	2.07	29	.66
	July	1	1.47	193			50	.38
1944	May	15	1.31	127	28	1.04	74	.26
1945	Feb.	8	1.24	143			64	.30
	May	4	1.70	227			41	.46
		31	1.71	234	23	1.26	38	.50
1946	Apr.	19	1.35	157			59	.32
		25	1.58	212			45	.42
	May	26	1.99	323	15	1.93	16	1.19
1946	Dec.	11	2.35	m439	8	3.62	7	2.71
1947	May	8	2.18	m320			17	1.12
		27	1.99	m265			27	.70
	June	8	2.00	m267			26	.73
1948	Apr.	21	1.27	m196			47	.40
	May	27	2.97	m770	1	29.0	1	19.0
		11	2.64	m637			3	6.33
	June	16	2.52	m578			4	4.75
Period 1908, 1911-13, 1915-21, 1932-48				374	Mean annual			

k Estimated.

m Provisional, subject to revision.

SNAKE RIVER BASIN

Snake River near Clarkston, Wash.

Location.- Lat. 46°25'30", long. 117°10'30", 2 miles upstream from Alpowa Creek, 7 miles downstream from Clarkston, and 134 miles upstream from mouth.

Drainage area.- 103,200 square miles.

Records available.- October 1915 to September 1922, August 1928 to September 1935 at site 66 miles downstream, published as Snake River at Riparia. October 1935 to September 1948 at present site and datum.

Gage.- Non-recording gage read once daily prior to Sept. 30, 1935, at site at Riparia.

Recording gage at Clarkston from Sept. 8, 1935. Datum of recording gage is 670 feet above mean sea level (Corps of Engineers bench mark).

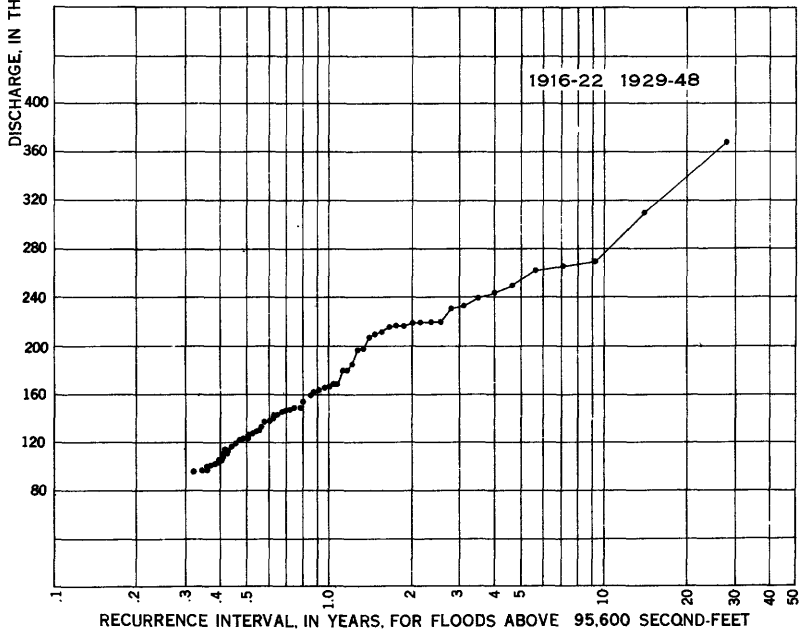
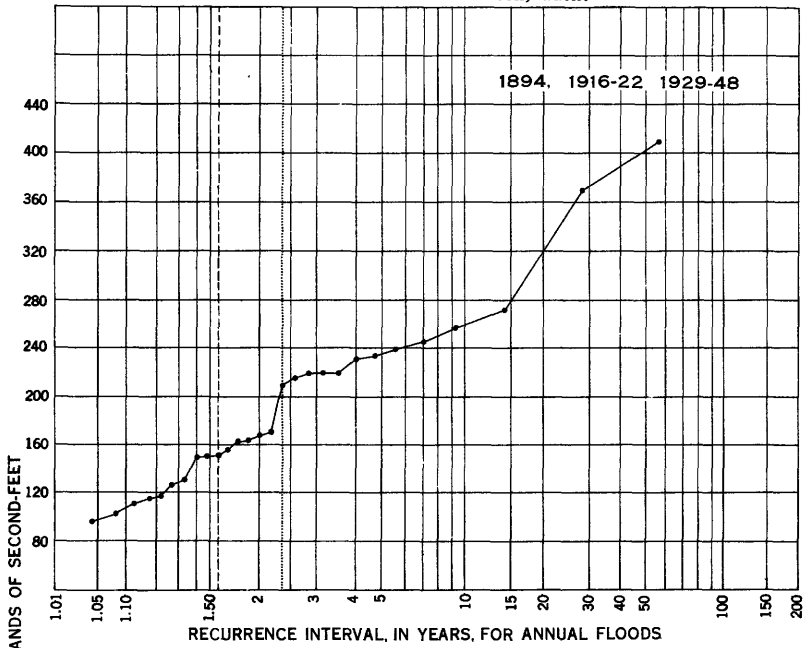
Stage-discharge relation.- Defined by current-meter measurements below 282,000 second-feet.

Maximum flood of record.- 369,000 second-feet May 29, 1948.

Historical data.- Maximum stage known, 24.7 feet, Riparia site and datum, June 5, 1894, determined from floodmarks by U. S. Weather Bureau (discharge, 409,000 second-feet).

Remarks.- Regulation by power plant on Clearwater River above Lewiston, Idaho. Many diversions for irrigation in southern Idaho.

## Snake River near Clarkston, Wash.



SNAKE RIVER BASIN  
Snake River near Clarkston, Wash.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1894	June	5	24.7	409,000	1	56.0	-	-
1916	Mar.	22	12.0	144,000	7	4.00	43	0.65
	Apr.	17-19	10.8	124,000			56	.50
	May	8	14.3	185,000			23	1.22
	June	20	16.8	230,000			10	2.80
1917	Apr.	14	10.7	122,000	3	9.33	59	.47
		28	12.9	160,000			33	.85
	May	16	18.0	252,000			5	5.60
		30	16.2	256,000			4	7.00
	June	10	16.0	216,000			15	1.87
		18	17.9	250,000			6	4.67
1917	Dec.	20	10.40	117,000			63	.44
		30	14.00	180,000			24	1.17
1918	Mar.	28	10.00	111,000	11	2.54	67	.42
	Apr.	14	10.20	114,000			65	.43
	May	6	13.20	166,000			29	.96
	June	14-15	16.00	216,000			16	1.75
1919	Apr.	5	10.6	120,000	14	2.00	61	.46
		30	11.6	138,000			47	.60
	May	30	13.3	167,000			28	1.00
1920	May	22	11.45	134,000	20	1.40	49	.57
	June	17	12.20	148,000			39	.72
1921	Mar.	18	11.20	131,000	2	14.0	50	.56
	Apr.	23	11.75	141,000			45	.62
	May	20	19.00	270,000			3	9.33
1922	Apr.	9	9.5	104,000	6	4.67	73	.39
	May	6	11.65	138,000			48	.58
		27	15.85	219,000			11	2.54
	June	7	16.5	233,000			9	3.11
1929	May	25	12.50	155,000	17	1.65	34	.82
	June	17	10.64	121,000			60	.47
1930	Apr.	26	9.02	95,600	27	1.04	82	.34
1931	Apr.	1	10.30	116,000	23	1.22	64	.44
	May	8	9.06	97,200			78	.36
		18	9.24	98,800			77	.36
1932	Mar.	21	10.94	123,000	8	3.50	58	.48
	Apr.	15	11.16	128,000			53	.53
	May	15	15.87	215,000			17	1.65
		23	16.06	219,000			12	2.33
	June	18	12.33	147,000			40	.70
1933	Apr.	29	11.12	128,000	4	7.00	54	.52
	June	11	17.36	245,000			7	4.00
1933	Dec.	23	13.20	164,000	15	1.87	30	.93
1934	Jan.	24	9.10	96,000			79	.35
	Apr.	1	9.94	109,000	9	3.11	70	.40
		15	9.80	109,000			71	.39
		26	10.52	118,000			62	.45
1934	May	9	9.08	96,000			80	.35
1935	Apr.	17	9.14	96,000	21	1.33	81	.35
	May	25	11.22	130,000			51	.55
1936	Apr.	25	31.05	199,000	9	3.11	21	1.33
	May	16	32.52	219,000			13	2.15
1937	May	19	23.76	114,000	24	1.17	66	.42
1938	Apr.	19	31.90	212,000	10	2.80	18	1.56
	May	2	29.50	180,000			25	1.12
	May	29-30	32.44	219,000			14	2.00
1939	Mar.	26	23.44	110,000	18	1.56	68	.41
	May	4	26.89	149,000			36	.78
1940	Feb.	29	22.36	102,000	22	1.27	74	.38
	Apr.	2	24.48	124,000			57	.49
	May	12	24.71	126,000			55	.51
1941	May	14	22.90	102,000	26	1.08	75	.37
	June	9	22.70	100,000			76	.37

SNAKE RIVER BASIN  
Snake River near Clarkston, Wash.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1942	Apr.	15	26.36	139,000	16	1.75	46	0.61
		23	25.65	130,000			52	.54
		May	27	28.27			162,000	32
1943	Apr.	20	31.69	209,000	12	2.33	19	1.47
		1	31.47	206,000			20	1.40
		22	30.80	197,000			22	1.27
1944	May	16	23.42	110,000	25	1.12	69	.41
1945	May	7	26.91	149,000	19	1.47	37	.76
		7	26.87	149,000			38	.74
1946	Mar.	31	22.02	95,600	13	2.16	83	.34
	Apr.	20	28.56	169,000			26	1.08
	May	9	28.15	164,000			31	.90
	June	2	26.30	142,000			44	.64
1946	Dec.	15	28.23	169,000	5	5.60	27	1.04
1947	May	10	33.22	239,000			8	3.50
	June	10	26.27	146,000			41	.68
1948	Jan.	8	22.68	106,000	1	28.0	72	.39
	Apr.	23	26.27	146,000			42	.67
	May	9	27.13	155,000			35	.80
		22	37.38	310,000			2	14.0
		29	40.36	369,000			1	28.0
Period 1894, 1916-22, 1929-48				192,500	Mean annual			

South Fork Boise River near Lenox, Idaho

Location.- Lat. 43°30', long. 115°41', 1½ miles upstream from Smith Creek, 4 miles upstream from flow line of Arrowrock Reservoir, 4 miles west of discontinued Lenox post office, 13 miles upstream from mouth, and 17 miles upstream from Arrowrock Dam.

Drainage area.- 1,090 square miles.

Records available.- March 1911 to December 1947.

Gage.- Non-recording gage read once daily prior to Apr. 10, 1915, recording gage thereafter.

Stage-discharge relation.- Defined by current-meter measurements.

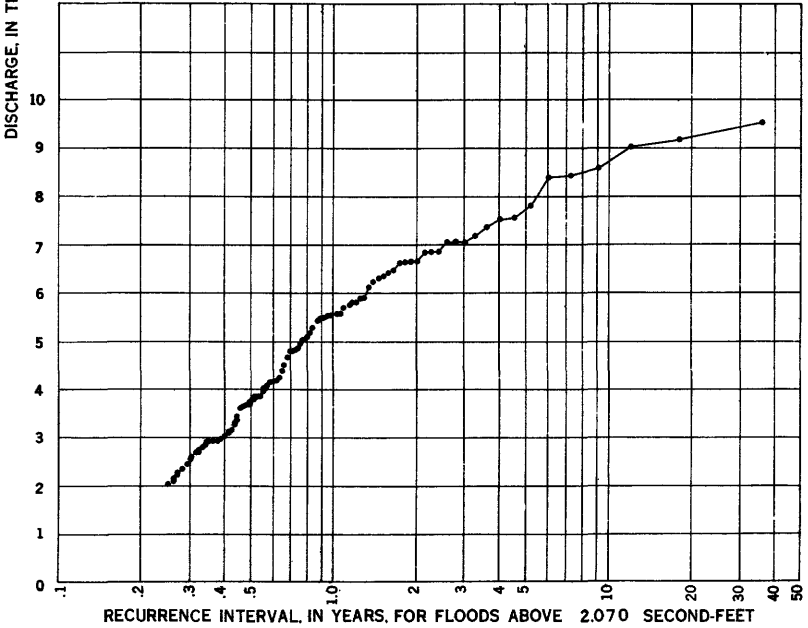
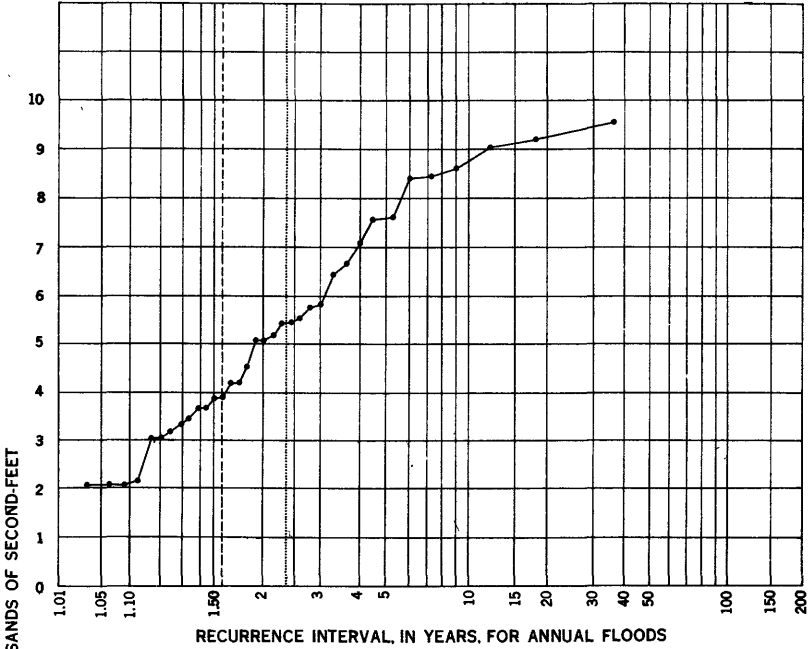
Maximum flood of record.- 9,550 second-feet Apr. 17, 1943.

Remarks.- Data for 1916-18 are daily mean flows except for annual maxima which are momentary peaks. Some water stored in Little Camas Reservoir and diverted for irrigation of about 5,000 acres of land in vicinity of Mountain Home. Storage began at Anderson Ranch Dam Dec. 15, 1945; no peaks listed thereafter because of regulation.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1911	Apr.	3	5.5	2,530	11	3.27	122	0.30
		28	6.6	3,790			72	.50
	May	6	7.7	5,480			39	.92
		16	7.3	4,960			48	.75
	June	13	8.4	6,420			23	1.57
1912	Apr.	10,11	5.6	2,920	12	3.00	104	.35
		30	5.6	2,920			105	.34
	May	20	7.8	5,800			30	1.20
	June	8-10	7.6	5,520			37	.97
1913	Apr.	15	6.1	3,290	16	2.25	84	.43
		21	5.9	3,040			91	.40
		27	6.0	3,160			86	.42
	May	10	6.8	4,210			58	.62
		28-30	7.7	5,440			41	.88
1914	Apr.	16	7.4	4,880	15	2.40	49	.74
	May	4	7.1	4,360			56	.64
		23	7.9	5,450			40	.90
	June	20	5.4	2,300			131	.27
1915	May	19	5.2	2,100	33	1.09	139	.26
1916	Apr.	12	6.8	4,150	8	4.50	62	.58
		27	8.0	6,240			26	1.38
	May	7	8.68	7,530			9	4.00
		21,22	6.5	3,690			75	.48
	June	10	7.2	4,810			51	.71
		19	7.8	5,880			28	1.29
		28	6.5	3,690			76	.47



South Fork Boise River near Lenox, Idaho, 1911-45



SNAKE RIVER BASIN  
South Fork Boise River near Lenox, Idaho--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-foot)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1917	Apr.	26	6.1	3,140	2	18.0	87	0.41
		15	9.53	9,200			2	18.0
	June	24, 29-30	7.8	5,880			29	1.24
		10	8.2	6,620			21	1.72
1918	Apr.	18	8.3	6,810	19	1.90	17	2.12
		1	5.45	2,370			128	.28
		13	5.55	2,480			123	.29
		25	5.75	2,700			113	.32
	May	5	6.7	3,990			66	.55
	June	13	7.33	5,040			46	.78
1919	Apr.	4	5.88	2,880	14	2.57	106	.34
		25	7.18	4,810			52	.69
	May	29	7.56	5,520			38	.95
1920	May	17	6.42	3,640	26	1.38	79	.46
	June	8	5.68	2,700			114	.32
1921	Apr.	4	5.92	2,940	3	12.0	96	.38
		13	6.06	3,120			88	.41
		23	6.40	3,610			80	.45
	May	17	9.44	9,020			3	12.0
	June	27	8.93	7,060			13	2.77
		12	9.18	7,060			12	3.00
		24	6.80	3,680			77	.47
	1922	Apr.	28	6.72			3,760	9
May		6	7.85	5,410	42	.86		
20		8.85	6,680	18	2.00			
26		9.05	7,060	14	2.57			
June		6	8.57	6,120	27	1.33		
		14	8.35	6,310	25	1.44		
1923	Apr.	13	5.32	2,200	18	2.00	136	.26
		17	5.83	2,820			109	.33
		30	5.37	2,260			133	.27
	May	10	6.81	4,100			63	.57
	26	7.42	5,080	45			.80	
	June	12	6.94	4,260			57	.63
	22	5.52	2,420	125			.29	
	July	1	5.69	2,640			118	.30
1924	May	13	5.19	2,150	32	1.12	137	.26
1925	Mar.	30	5.38	2,310	10	3.60	130	.28
	Apr.	12	7.54	5,260			43	.83
	May	8	7.81	5,800			31	1.16
	21	8.25	6,660	19			1.90	
	June	22	6.64	3,800			71	.51
1926	Apr.	30	5.99	3,000	31	1.16	94	.38
		19	5.57	2,420			126	.29
	May	5	6.04	3,040			92	.39
	May	1	8.14	5,530			36	1.00
		17	10.1	8,440			5	7.20
1927	June	8	8.90	6,650	5	7.20	20	1.80
	Mar.	25	5.33	2,220	7	5.14	134	.27
11		8.71	7,570	8			4.50	
26		8.08	6,370	24			1.50	
1928	May	25	6.48	3,660	25	1.44	78	.46
	June	16	5.85	2,780			112	.32
1929	Apr.	13	5.34	2,220	27	1.33	135	.27
		25	5.70	2,600			119	.30
	May	4	5.23	2,120			138	.26
	30	6.33	3,440	81			.44	
	June	12	5.92	2,840			108	.33
1930	May	7	5.16	2,100	34	1.06	140	.26
		16	5.16	2,100			141	.26
1931	Apr.	15	5.92	2,940	13	2.77	97	.37
		14	7.69	5,730			32	1.13
		22	7.63	5,550			34	1.06
		June	16	7.10			4,680	53

SNAKE RIVER BASIN  
South Fork Boise River near Lenox, Idaho--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1933	Apr. June	29	6.53	3,730	17	2.12	74	0.49
		3	7.41	5,190			44	.82
		14-16	7.19	4,850			50	.72
1934	Mar.	29	5.11	2,070	35	1.03	142	.25
1935	Apr.	16	5.84	2,940	21	1.72	98	.37
		21	5.91	3,060			89	.40
	May	7	5.90	3,000			95	.38
		24	6.68	4,190			59	.61
1936	Apr.	24	9.03	8,400	6	6.00	6	6.00
		5	7.59	5,550			35	1.03
	May	15	8.24	6,860			15	2.40
		1	6.78	4,190			60	.60
		7	6.23	3,380			82	.44
1937	Apr.	16	5.34	2,270	30	1.20	132	.27
		27	5.09	2,070			143	.25
	May	6	6.00	3,060			90	.40
1937	Dec.	12	7.10	4,680	4	9.00	54	.67
1938	May	1	9.31	8,600			4	9.00
		17	8.22	6,480			22	1.64
		28	8.93	7,810			7	5.14
1939	Apr.	30	5.88	2,820	28	1.29	110	.33
		4	5.87	2,940			99	.36
	May	22	5.57	2,590			120	.30
1940	Mar.	5	6.13	3,320	22	1.64	83	.43
		27	5.83	2,940			103	.35
	Apr.	1	5.94	2,940			100	.36
1941	May	15	5.81	2,820	23	1.57	111	.32
		20	5.93	2,940			101	.36
		27	5.92	2,940			102	.35
	4	5.58	2,590	121			.30	
	13	6.84	4,190	61			.59	
	June	8	5.61	2,700			116	.31
1942	Apr.	4	5.75	2,700	20	1.80	115	.31
		13	6.65	3,880			67	.54
	May	27	6.57	3,880			68	.53
1943	Apr.	8	5.61	2,700	1	36.0	116	.31
		14	6.68	4,030			65	.55
	May	22	6.60	3,880			69	.52
1944	May	26	7.00	4,510	29	1.24	55	.65
		8	6.72	4,030			64	.56
	June	8	6.72	4,030			64	.56
1945	Apr.	8, 9	8.52	6,850	1	36.0	16	2.25
		17	10.05	9,550			1	36.0
	May	5	8.70	7,190			11	3.27
	31	8.82	7,370	10			3.60	
	June	13	7.42	5,040			47	.77
1946	May	19	7.76	5,680	29	1.24	33	1.09
		1	5.08	2,070			144	.25
	7	5.48	2,480	124			.29	
1947	May	15	6.08	3,180	24	1.50	85	.42
		31	5.37	2,380			127	.28
	June	9	5.31	2,320			129	.28
1948	Apr.	22	5.62	2,690	24	1.50	117	.31
		6	6.52	3,880			70	.51
	May	3	5.89	3,040			93	.39
1949	May	23	5.74	2,860	24	1.50	107	.34
		3	5.89	3,040			93	.39
	June	23	5.74	2,860			107	.34
Period 1911-45				5,260	Mean annual		-	-

## SNAKE RIVER BASIN

Malheur River near Drewsey, Oreg.

Location.- Lat. 43°47', long. 118°20', 300 feet downstream from crossing of Burns-Ontario highway, half a mile downstream from Cottonwood Creek, and 3 miles southeast of Drewsey.

Drainage area.- 982 square miles.

Records available.- June 1939 to September 1948. June 1928 to June 1939 at site 7 miles downstream (1931, 1934, 1937 fragmentary).

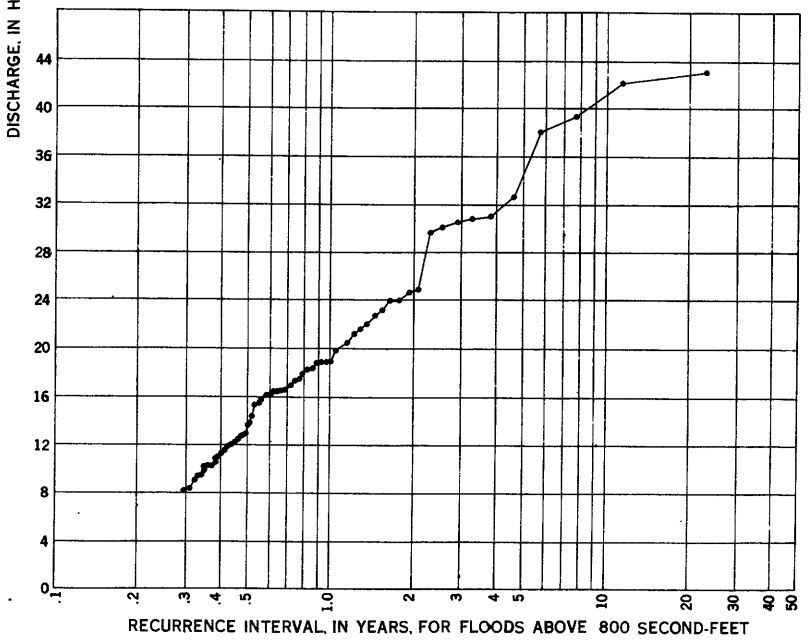
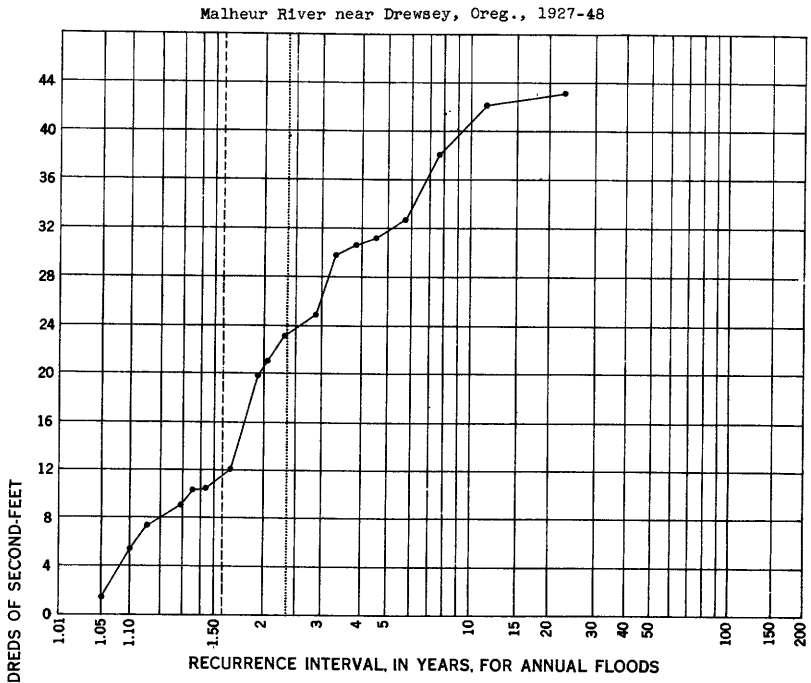
Gage.- Recording. Datum of gage is 3,479.29 feet above mean sea level, datum of 1929.

Stage-discharge relation.- Defined by current-meter measurements below 2,500 second-feet.

Maximum flood of record.- 4,290 second-feet Feb. 27, 1940.

Remarks.- No regulation. Flood flow not materially affected by diversions above station.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1927	Feb.	21	6.46	2,300	10	2.30	15	1.53
	Mar.	14	5.20	1,290			47	.49
	Apr.	3	4.63	942			68	.34
		29	5.32	1,360			46	.50
	June	9	5.66	1,640			37	.62
1928	Mar.	6	6.18	2,040	6	3.93	20	1.15
		12	6.61	2,390			14	1.64
		27	7.30	3,050			8	2.88
1929	Mar.	6	6.00	2,100	11	2.09	19	1.21
		8	4.89	1,280			48	.48
1930	Feb.	13	4.52	1,020	17	1.35	63	.37
1931	Mar.	19	3.55	565	21	1.10	-	-
1932	Mar.	19	8.17	3,800	3	7.67	4	5.75
		25	5.00	1,080			60	.38
	Apr.	15	5.08	1,150			56	.41
		27	5.17	1,180			55	.42
1933	Apr.	4	4.60	815	19	1.21	76	.30
		29	4.66	845			74	.31
1934	Jan.	12	2.62	132	22	1.05	-	-
		24	2.62	132			-	-
1935	Apr.	9	4.60	810	18	1.28	77	.30
		17	4.77	900			73	.32
1936	Feb.	22	6.72	2,400	9	2.56	13	1.77
	Apr.	12	5.27	1,240			50	.46
		20	5.73	1,610			38	.61
1937	Apr.	16	4.44	730	20	1.15	-	-
1937	Dec.	12	5.75	1,610	12	1.92	39	.59
1938	Feb.	27	4.74	900			72	.32
	Mar.	2	5.86	1,690			32	.72
		14	5.73	1,610			40	.58
		17	5.28	1,270			49	.47
		19	5.08	1,130			58	.40
		28	4.58	810			78	.29
	Apr.	20	6.20	1,970			22	1.05
		25	6.09	1,890			23	1.00
1939	Mar.	21	4.96	1,030	16	1.44	61	.38
1940	Feb.	6	6.65	1,020	1	23.0	62	.37
		10	6.38	915			71	.32
		27	11.35	4,290			1	23.0
		28	11.05	3,930			3	7.67
	Mar.	8	6.46	935			69	.33
		27	9.90	3,000			9	2.56
		31	10.00	3,080			7	3.29
1940	Dec.	27	6.54	978	5	4.60	66	.35
1941	Jan.	26	6.54	1,020			64	.36
	Feb.	24	7.89	1,670			33	.70
	Mar.	2	10.02	3,100			6	3.83
		6	7.83	1,640			36	.64
		9	8.10	1,780			29	.79
		18	8.25	1,670			26	.88
		28	7.39	1,420			44	.52
	Apr.	5	8.16	1,820			27	.85
		11	6.89	1,180			54	.43



SNAKE RIVER BASIN  
Malheur River near Drewsey, Oreg.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-foot)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1942	Mar. Apr.	12	7.70	1,570	13	1.77	41	0.56
		2	8.16	1,820			28	.82
		4	8.26	1,880			25	.92
		13	8.01	1,740			30	.77
1942	Nov.	29	6.10	830			75	.31
1943	Jan.	1	8.46	2,000			21	1.10
		21	8.86	2,250			16	1.44
	Mar.	9	7.84	1,640			35	.66
		14	7.33	1,380			45	.51
	Apr.	28	9.16	2,460	8	2.88	12	1.92
		8	8.68	2,140			18	1.28
		16	9.19	2,480			11	2.09
1944	Feb.	7	6.68	1,090	14	1.64	59	.39
	Mar.	10	6.94	1,200			52	.44
1945	Jan.	7	7.86	1,650	4	5.75	34	.68
	Feb.	8	10.27	3,260			5	4.60
		14	8.81	2,180			17	1.35
	Mar.	23	8.27	1,880			24	.96
	Apr.	22	6.80	1,140			57	.40
1945	Dec.	28	6.97	1,220			51	.45
1946	Feb.	27	9.85	2,960	7	3.29	10	2.30
	Mar.	6	6.32	933			70	.33
		13	7.66	1,550			42	.55
		21	7.65	1,540			43	.53
	Apr.	19	8.00	1,730			31	.74
1947	Feb.	13	11.41	4,210	2	11.5	2	11.5
		17	6.35	945			67	.34
1948	Jan.	7	6.95	1,200	15	1.53	53	.43
	Apr.	22	6.40	1,010			65	.35
Period 1927-48				2,060	Mean annual			

Salmon River below Yankee Fork, near Clayton, Idaho

Location.- Lat. 44°16', long. 114°44', a quarter of a mile downstream from Yankee Fork and 18 miles upstream from Clayton.

Drainage area.- 841 square miles.

Records available.- October 1921 to September 1948.

Gage.- Staff gage read once or twice daily prior to Sept. 3, 1927, recording gage thereafter.

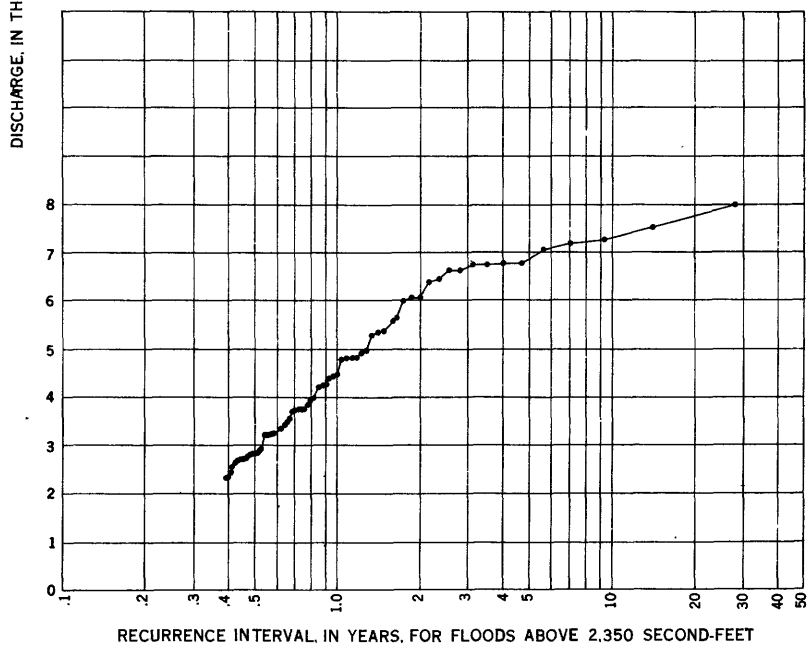
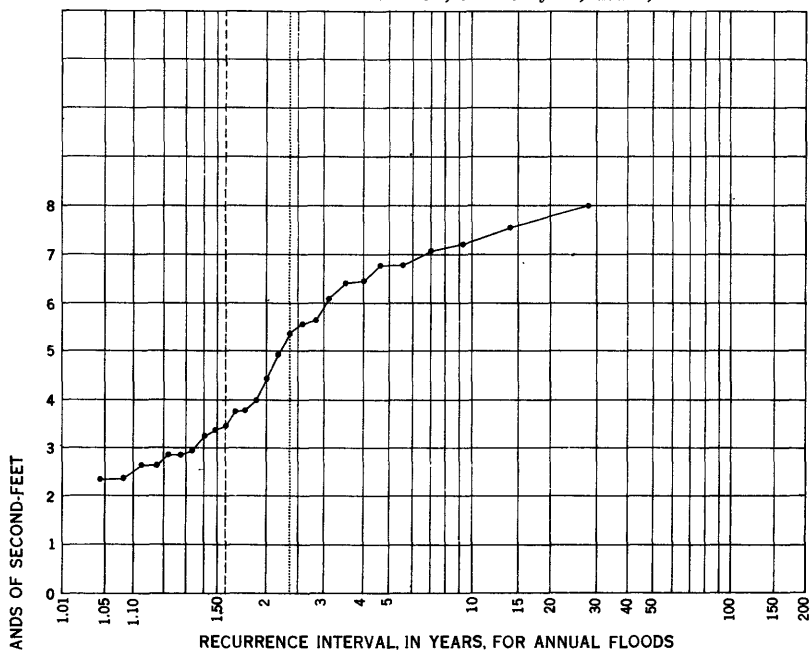
Stage-discharge relation.- Defined by current-meter measurements below 6,200 second-feet.

Maximum flood of record.- 8,000 second-feet (estimated) June 27, 1927.

Remarks.- Small diversions above station for irrigation.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1922	May	26	5.90	4,810	6	4.67	25	1.12
	June	7	7.60	6,760			8	3.50
		15,17	7.60	6,760			9	3.11
1923	May	26	5.40	4,260	13	2.15	32	.88
	June	12,13	6.00	4,920			23	1.22
	July	1	4.39	3,220			52	.54
1924	May	17,18	4.00	2,820	23	1.22	57	.49
1925	May	29	6.60	5,620	10	2.80	17	1.65
	June	22,23	5.90	4,810			26	1.08
1926	May	5	3.50	2,360	26	1.08	70	.40
1927	May	17	7.20	4,820	1	28.0	24	1.17
		27	5.40	2,770			60	.47
	June	13	9.10	7,260			3	9.33
		27		8,000			1	28.0
1928	May	10,11	8.08	6,070	2	14.0	14	2.00
		26	8.96	7,530			2	14.0

Salmon River below Yankee Fork, near Clayton, Idaho, 1922-48



SNAKE RIVER BASIN  
Salmon River below Yankee Fork, near Clayton, Idaho--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1929	May	24	5.93	3,330			47	0.60
	June	16	6.05	3,440	18	1.56	44	.64
1930	May	21	5.44	2,720			61	.46
		30	6.3	3,760	17	1.65	38	.74
	June	11,12	6.3	3,760			39	.72
1931	May	16		k2,350	27	1.04	72	.39
1932	May	21	7.11	4,800			27	1.04
	June	16	7.49	5,360	12	2.33	19	1.48
1933	June	10	8.07	6,400	8	3.50	13	2.15
1934	Apr.	25	5.43	2,720			62	.45
	May	8	5.71	2,940	21	1.33	53	.53
1935	June	9,10		k4,000	15	1.87	34	.82
1936	Apr.	23	6.67	3,960			35	.80
	May	5	6.31	3,500			43	.65
		15	8.09	6,000			16	1.75
	June	2	8.39	6,450	7	4.00	12	2.33
1937	May	28	5.52	2,620	25	1.12	67	.42
1938	May	1	6.59	3,870			36	.78
		17	6.59	3,740			40	.70
		28	8.73	6,770			7	4.00
	June	7	8.78	6,770	5	5.60	6	4.67
		30	7.05	4,400			30	.93
1939	May	5	5.39	2,620	24	1.17	66	.42
1940	May	25	6.71	3,770	16	1.75	37	.76
	June	14	5.17	2,360			71	.39
1941	May	13	5.38	2,530			68	.41
	June	26,27	6.27	3,370	19	1.48	45	.62
		8	5.61	2,710			63	.44
1941	Dec.	3	6.15	3,270			48	.58
1942	Apr.	13	5.32	2,440			69	.41
		22	5.72	2,890			54	.52
	May	26	8.14	5,570	11	2.55	18	1.56
	June	9	7.70	4,990			22	1.27
1943	Apr.	19,24	6.15	3,240			50	.56
	May	5	7.27	4,490			28	1.00
	May	29	9.30	7,200	3	9.33	4	7.00
	June	13	7.89	5,280			21	1.33
		19	8.91	6,650			10	2.80
	July	22	6.47	3,570			42	.67
1944	May	17	5.73	2,830	22	1.27	56	.50
	June	1	5.57	2,680			65	.43
		9	5.71	2,810			58	.48
		27	5.59	2,700			64	.44
1945	June	10	5.69	2,790			59	.47
		9	5.74	2,840			55	.51
		23	6.16	3,250	20	1.40	49	.57
1946	Apr.	26	6.15	3,240			51	.55
	May	8	6.61	3,720			41	.68
	June	28	7.03	4,210			33	.85
		6	7.22	4,430	14	2.00	29	.96
1947	May	9	8.58	6,060	9	3.11	15	1.87
	June	27	8.02	5,310			20	1.40
		20	6.34	3,370			46	.61
1948	May	19	7.18	4,270			31	.90
	June	29	9.00	6,650			11	2.55
		3	9.27	7,060	4	7.00	5	5.60

Period 1922-48

4,750

Mean annual

k Estimated.



## SNAKE RIVER BASIN

Salmon River at Whitebird, Idaho

Location.- Lat. 45°45', long. 116°20', just upstream from Whitebird Creek, half a mile downstream from Canfield-Joseph highway bridge, and 1 mile southwest of Whitebird.

Drainage area.- 13,550 square miles, including that of Whitebird Creek.

Records available.- August 1910 to September 1917, October 1919 to September 1948.

Gage.- Non-recording gage read once or twice daily prior to Jan. 3, 1931, recording gage thereafter. Datum of recording gage is 10 feet lower than that of non-recording gage.

Stage-discharge relation.- Defined by current-meter measurements below 90,000 second-feet.

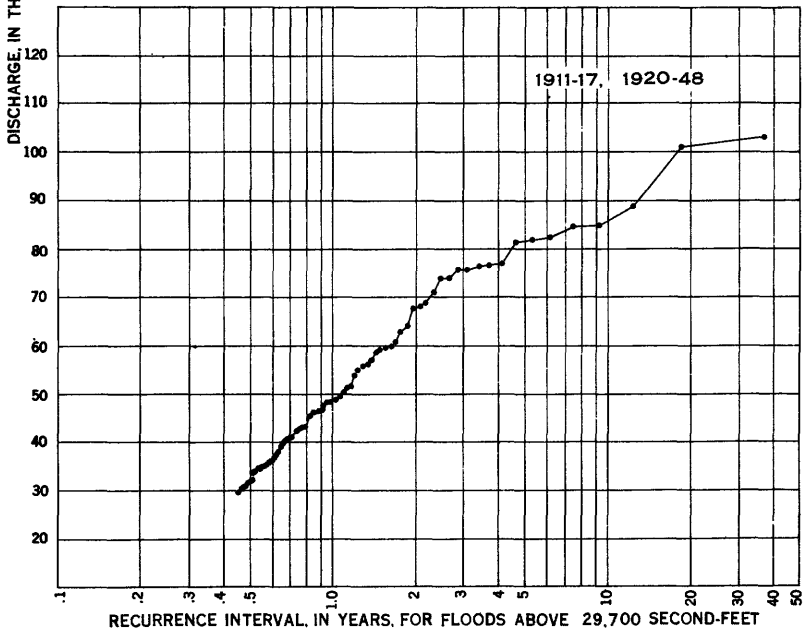
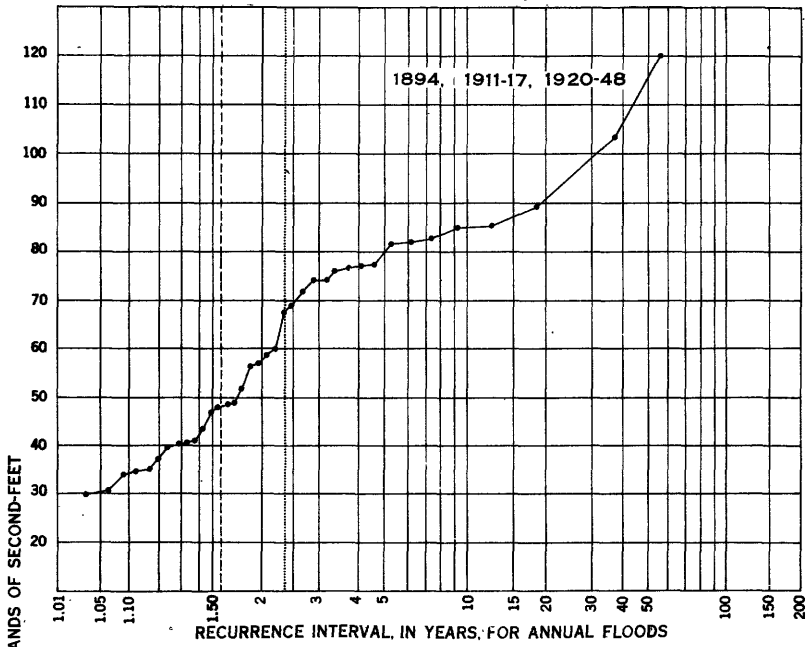
Maximum flood of record.- 103,000 second-feet June 3, 1948.

Historical data.- Maximum stage known, about 37.5 feet, present datum, June 1894 (discharge, 120,000 second-feet).

Remarks.- Amount of water diverted above station for irrigation is negligible percentage of total flow.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1894	June	-	37.5	120,000	1	56.0		
1911	May	17	10.6	33,900	9	4.11	71	0.52
	June	15	18.7	76,800			10	3.70
1912	May	21	13.6	49,400	11	3.36	35	1.06
	June	9	18.5	75,600			12	3.08
1913	May	11	12.4	43,100	7	5.29	48	.77
		28	19.7	81,200			8	4.62
1914	May	24	14.0	51,500	21	1.76	32	1.16
	June	4	13.0	46,200			44	.84
1915	June	2	10.6	33,900	34	1.09	72	.51
1916	Apr.	28	10.05	30,800	3	12.3	78	.47
	May	7	13.45	48,200			38	.97
		22	10.00	30,800			79	.47
	June	19	20.05	84,900			4	9.25
		29	16.00	62,500			21	1.76
1917	May	15	12.9	45,500	8	4.62	45	.82
		30	14.0	51,400			33	1.12
		10	14.8	55,700			29	1.28
	June	18,19	18.6	77,000			9	4.11
1920	May	23	11.28	36,300	19	1.95	62	.60
	June	17	15.09	56,700			27	1.37
1921	May	19	19.13	75,600	2	18.5	13	2.85
	June	9	21.18	88,800			3	12.3
1922	May	26	15.70	54,900	16	2.31	30	1.23
	June	7	18.04	67,200			19	1.95
1923	May	26	14.80	50,300	20	1.85	34	1.09
	June	12	15.94	56,000			28	1.32
1924	May	17	12.80	40,100	29	1.28	55	.67
1925	May	21	16.45	58,600	18	2.06	26	1.42
	June	22	12.50	38,700			58	.64
1926	May	5	10.80	30,600	35	1.06	80	.46
1927	May	17	16.39	59,000	13	2.85	25	1.48
	June	9	18.88	73,800			15	2.47
1928	June	23	20.06	81,600	6	6.17	7	5.29
1929	May	25	14.45	48,200	23	1.61	39	.95
	June	16		46,600			41	.90
1930	May	22	10.98	31,600	28	1.32	75	.49
		30	12.86	40,600			54	.68
	June	11	11.94	35,800			64	.58
1931	May	17	20.83	29,700	36	1.03	82	.45

## Salmon River at Whitebird, Idaho



SNAKE RIVER BASIN  
Salmon River at Whitebird, Idaho--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-foot)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1932	May	14	27.01	63,600	15	2.47	20	1.85
		22	27.77	68,500			17	2.18
	June	17	26.52	60,500			22	1.68
1933	June	15	29.86	82,200	5	7.40	6	6.17
1934	Apr.	25	21.91	34,900	32	1.16	67	.55
	May	9	21.26	31,900			74	.50
1935	June	2	23.49	43,200	26	1.42	47	.79
1936	Apr.	24	23.09	41,000	14	2.64	52	.71
	May	6	23.27	42,100			51	.73
		15	28.20	71,100			16	2.31
	June	1	24.48	48,800			36	1.03
1937	May	27	21.75	34,400	33	1.12	69	.54
1938	May	2	23.94	45,400	10	3.70	46	.80
		18	23.45	42,700			49	.75
		28	28.95	76,200			11	3.36
1939	May	5	23.12	41,000	27	1.37	53	.70
		18	22.13	35,900			63	.59
1940	May	14	24.29	47,600	24	1.54	40	.92
1941	May	14	22.76	39,500	30	1.23	57	.85
		27	22.39	37,400			60	.62
	June	9	21.25	31,400			76	.49
		20	20.96	30,500			81	.46
1942	Apr.	15	21.14	31,000	17	2.18	77	.48
		23	21.94	34,400			70	.53
	May	27	27.00	59,900			23	1.61
	June	10	26.78	59,300			24	1.54
1943	Apr.	20	24.10	46,500	12	3.08	43	.86
	May	6	22.93	40,100			56	.66
	June	1	28.63	73,900			14	2.64
		20	27.66	67,700			18	2.06
1944	May	16	21.94	35,100	31	1.19	65	.57
		1	22.28	36,800			61	.61
		13	21.84	34,600			68	.54
1945	May	11	22.09	35,000	22	1.68	66	.56
		7	24.70	48,500			37	1.00
		23	22.67	37,900			59	.63
1946	Apr.	28	21.69	32,100	25	1.48	73	.51
		9	23.73	42,600			50	.74
		28	24.47	46,600			42	.88
1947	May	9	30.35	84,500	4	9.25	5	7.40
		28	25.62	53,800			31	1.19
1948	May	29	32.59	101,000	1		2	18.5
		3	32.95	103,000			1	37.0
Period 1911-17, 1920-48				59,570	Mean annual			

Grande Ronde River at Rondowa, Oreg.

Location.- Lat. 45°44', long. 117°47', at Rondowa, 500 feet downstream from Wallowa River.

Drainage area.- 2,555 square miles.

Records available.- October 1926 to September 1948 (1931 fragmentary).

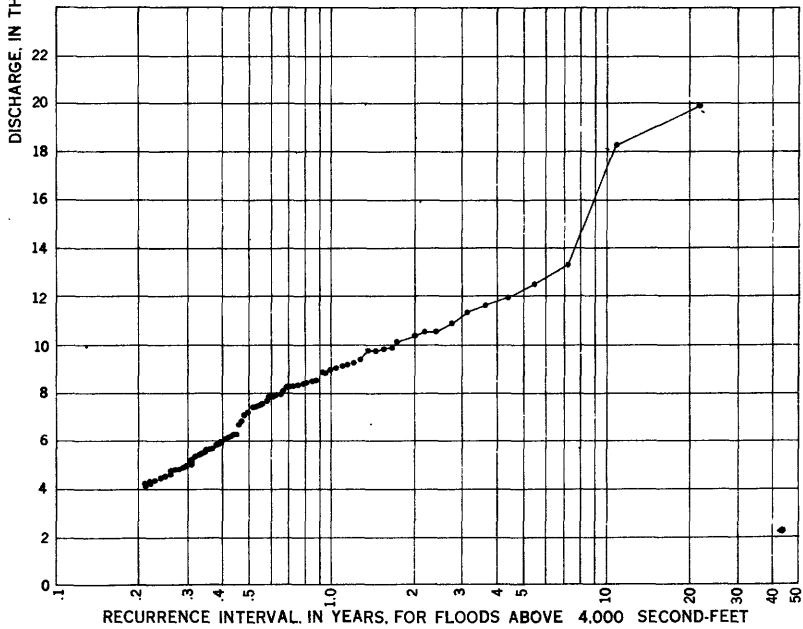
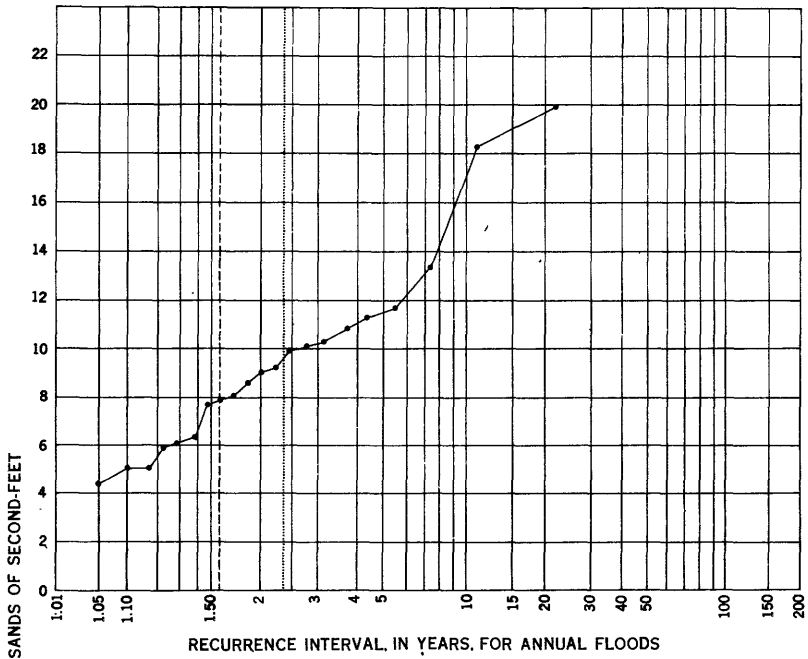
Gage.- Recording. Datum of gage is 2,281.4 feet above mean sea level, datum of 1929 (Union Pacific System track profile).

Stage-discharge relation.- Defined by current-meter measurements below 14,000 second-feet.

Maximum flood of record.- 19,900 second-feet May 28, 1948.

Remarks.- Differences between figures shown herein and previously published peak discharges represent minor changes resulting from use of average rating curve for purposes of consistency for flood-frequency study and are not to be considered revisions, except for discharges above 10,000 second-feet which are revisions and supersede previously published figures.

Grande Ronde River at Rondowa, Oreg., 1927-30, 1937-48



SNAKE RIVER BASIN  
Grande Ronde River at Rondowa, Oreg.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1927	Feb.	3	4.02	4,240	8	2.75	102	0.22
		21	5.89	8,240			32	.69
	Apr.	28	5.95	8,390			28	.79
	May	17	6.27	9,240			18	1.22
	June	9	6.58	10,100			12	1.83
		26	5.58	7,470			41	.54
1927	Nov.	20	4.17	4,520	3	7.33	88	.25
1928	Jan.	13	6.18	9,000			22	1.00
	Mar.	11	7.70	13,300			3	7.33
		23	5.57	7,450			42	.52
	June	10	6.48	9,810			14	1.57
1929	Mar.	21	4.54	5,240	12	1.83	69	.32
	Apr.	29	4.10	4,390			93	.24
	May	24	5.94	8,360			29	.76
	June	16	6.01	8,550			25	.88
1930	Apr.	9	3.91	4,030	21	1.05	109	.20
		24	4.05	4,300			100	.22
	May	3	4.09	4,370			95	.23
1932	Feb.	27	4.21	4,600	2	11.0	86	.26
	Mar.	18	9.30	18,300			2	11.0
		k24	6.2	9,050			21	1.05
	Apr.	3	6.5	9,860			13	1.69
		k14	7.5	12,700			4	5.50
	May	14	7.21	11,900			5	4.40
	June	16	4.72	5,600			62	.35
		24	4.59	5,340			68	.32
1933	Mar.	17	3.95	4,100	4	5.50	108	.20
	Apr.	4	4.29	4,750			82	.27
		28	5.74	7,860			36	.61
	June	5	6.74	10,500			10	2.20
		16	7.11	11,600			6	3.67
1934	Jan.	23	4.12	4,430	20	1.10	91	.24
	Mar.	6	4.30	4,770			80	.28
		31	4.00	4,200			104	.21
	Apr.	24	4.00	4,200			105	.21
1935	Apr.	16	5.78	7,960	14	1.57	35	.63
		21	4.98	6,130			53	.42
	May	23	4.74	5,640			69	.37
		31	4.65	5,460			64	.34
1936	Mar.	3	4.30	4,770	5	4.40	81	.27
		9	4.15	4,480			89	.25
	Apr.	19	7.03	11,300			7	3.14
	May	15	6.80	10,700			9	2.44
1937	Apr.	15	4.62	5,400	16	1.38	66	.33
	May	14	4.88	5,920			55	.40
		27	5.05	6,280			49	.45
	June	3	4.31	4,790			78	.28
		16	4.12	4,430			92	.24
		20	4.68	5,520			63	.35
1938	Mar.	19	4.27	4,710	11	2.00	84	.26
	Apr.	18	5.94	8,360			30	.73
	May	1	5.59	7,500			40	.55
		28	6.18	9,000			23	.96
1939	Mar.	25	6.47	9,780	9	2.44	15	1.47
	May	3	5.25	6,710			48	.46
		30	4.29	4,750			83	.27
1940	Feb.	6	4.31	4,790	18	1.22	79	.28
		28	4.88	5,920			56	.39
	Mar.	28	4.84	5,840			58	.38
	May	12	4.61	5,380			67	.33
		25	4.35	4,860			75	.29
1941	May	3	4.03	4,260	17	1.29	101	.22
		13	4.49	5,140			70	.31
	June	8	4.96	6,090			54	.41
		29	4.45	5,060			71	.31
1942	Mar.	12	4.07	4,330	15	1.47	98	.22
	Apr.	17	5.57	7,450			43	.51
	May	10	4.75	5,660			59	.37
		24	5.65	7,640			38	.58
	July	2	4.34	4,850			76	.29

SNAKE RIVER BASIN  
Grande Ronde River at Rondowa, Oreg.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-foot)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1943	Jan.	1	4.18	4,540	7	3.14	87	0.25
	Feb.	22	4.06	4,310			99	.22'
	Mar.	31	6.47	9,780			16	1.38
	Apr.	16	6.67	10,300			11	2.00
	May	28	5.74	7,860			37	.59
	June	19	5.79	7,980			34	.65
	July	4	5.43	7,120			46	.48
1944	Mar.	10	3.99	4,180	19	1.16	106	.21
	May	7	4.02	4,240			103	.21
		15	4.41	4,980			72	.31
		31	4.39	4,940			74	.30
	June	10	4.13	4,450			90	.24
		22	4.08	4,350			96	.23
1945	May	5	5.84	8,110	13	1.69	33	.67
	June	5	5.52	7,330			44	.50
		22	5.04	6,250			50	.44
1945	Dec.	29	5.90	8,260	10	2.20	31	.71
1946	Feb.	28	4.10	4,390			94	.23
	Mar.	12	5.62	7,570			39	.56
		29	4.33	4,830			77	.29
	Apr.	20	6.12	8,830			24	.92
		26	6.24	9,160			19	1.16
	May	9	6.23	9,130			20	1.10
		28	5.97	8,440			27	.81
	June	4	5.31	6,840			47	.47
		22	4.23	4,640			85	.26
	July	9	4.08	4,350			97	.23
1946	Dec.	12	6.83	10,800	6	3.67	8	2.75
1947	Feb.	12	4.40	4,960			73	.30
	Mar.	23	3.98	4,160			107	.21
	Apr.	20	4.74	5,640			61	.36
	May	8	6.32	9,370			17	1.29
		28	4.65	5,460			65	.34
	June	9	4.87	5,900			57	.39
1948	Jan.	7	4.99	6,150	1	22.0	52	.42
	Feb.	21	5.00	6,170			51	.43
		25	5.44	7,140			45	.49
	Apr.	22	5.98	8,470			26	.85
	May	28	9.76	19,900			1	22.0
Period 1927-30, 1932-48				9,440	Mean annual			

k Estimated.

Clearwater River at Kamiah, Idaho

Location.- Lat. 46°14', long. 116°01', a quarter of a mile downstream from highway bridge at Kamiah, three-quarters of a mile downstream from Lawyer Creek, and 6 miles downstream from South Fork.

Drainage area.- 4,850 square miles.

Records available.- August 1910 to September 1948.

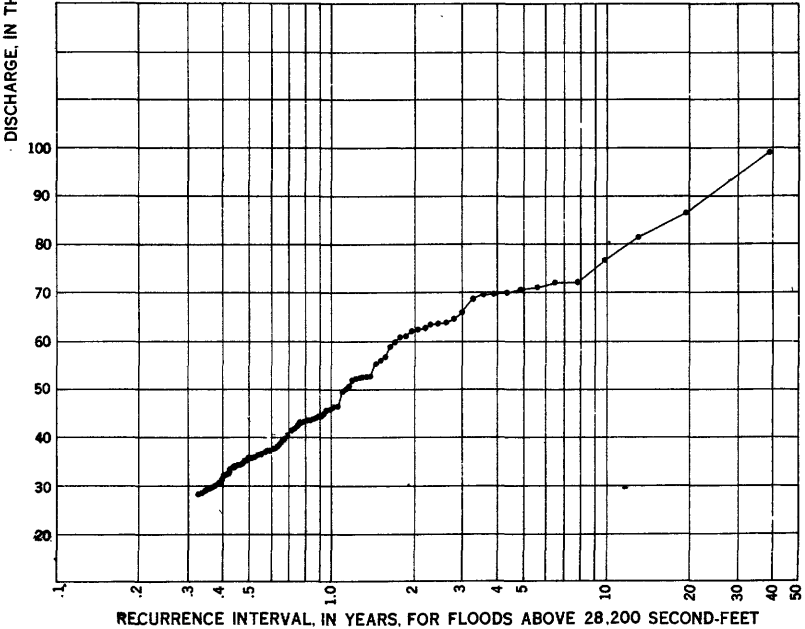
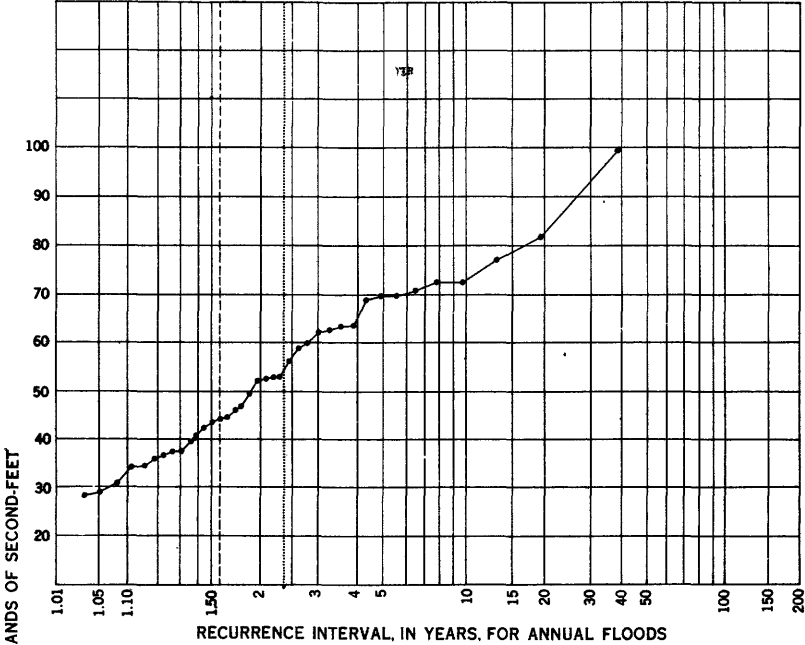
Gage.- Non-recording gage read once or twice daily August 1910 to July 1914, once daily August 1914 to Feb. 9, 1934, recording gage thereafter. Datum of gage is 1,162.52 feet above mean sea level, datum of 1929, supplementary adjustment of 1947.

Stage-discharge relation.- Defined by current-meter measurements.

Maximum flood of record.- 99,000 second-feet May 29, 1948.

Remarks.- Some diurnal regulation at low flow caused by power plant on South Fork.

Clearwater River at Kamiah, Idaho, 1911-48



SNAKE RIVER BASIN  
Clearwater River at Kamiah, Idaho--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1911	May	6	10.8	34,800	29	1.35	83	0.47
		17	10.0	29,400			110	.35
	June	4	11.0	35,900			75	.52
		15	11.5	39,500			58	.67
1912	May	21	13.6	55,200	15	3.00	27	1.44
		20	14.4	61,900			20	1.95
	June	21	11.3	38,000			62	.65
1913	Apr.	20	10.0	29,400	3	13.0	111	.35
		27	10.2	30,700			101	.39
	May	11	12.4	45,800			40	.98
		26	16.1	76,600			4	9.75
1914	May	18	11.9	42,200	27	1.44	53	.74
		23	11.8	41,500			55	.71
	June	5	10.2	30,700			102	.58
1915	May	19	9.8	28,200	38	1.03	120	.32
1916	Apr.	28	10.1	30,000	16	2.44	104	.37
	May	7	12.2	44,400			43	.91
	June	5, 9	11.1	36,800			69	.57
		19	13.7	56,000			26	1.50
1917	May	29	11.1	36,800	6	6.50	70	.56
		15	14.7	63,600			15	2.60
	June	30	15.4	69,700			10	3.90
		9	13.8	56,800			25	1.56
1917 1918	Dec.	29, 30	11.3	37,300	17	2.29	8	4.88
		5	13.3	52,800			65	.60
	May	15	10.9	35,200			28	1.39
		10	13.3	52,800			80	.49
1919	Apr.	29	10.3	30,700	20	1.95	29	1.35
		23	13.3	52,000			103	.38
	May	23	13.3	52,000			33	1.18
1920	May	18	12.0	43,600	26	1.50	47	.83
	June	16	11.9	42,900			52	.75
1921	Apr.	23	10.9	35,200	8	4.88	81	.48
	May	20	15.3	69,700			11	3.55
1922	May	19	14.2	60,600	12	3.25	22	1.77
		26	13.2	52,100			32	1.22
	June	6	14.4	62,400			18	2.17
1923	May	8-10	11.5	38,800	21	1.86	60	.65
		26	12.9	49,600			36	1.08
	June	12	12.1	43,200			49	.80
1924	May	4	12.4	45,600	15	2.60	41	.95
		13	14.0	58,900			24	1.62
1925	Apr.	17	11.9	41,800	14	2.79	54	.72
	May	7	12.3	44,800			42	.93
		20	14.1	59,800			23	1.70
1926	Apr.	19	11.1	35,900	33	1.18	76	.51
	May	1	11.1	35,900			77	.51
		21	10.6	32,400			95	.41
1927	Apr.	28	12.4	46,400	9	4.33	37	1.05
	May	17	14.5	64,200			14	2.79
	June	8	15.0	68,600			12	3.25
1927	Nov.	5	12.2	43,900			46	.85
		26	10.1	29,200			113	.35
1928	May	9	14.8	65,700	4	9.75	13	3.00
		26	15.5	72,100			5	7.80
1929	May	24	13.28	52,700	18	2.17	30	1.30
	June	1	10.0	28,500			117	.33
		9	11.1	35,800			78	.50
1930	Apr.	25	10.45	31,000	36	1.08	100	.39
1931	May	7	11.77	40,800	28	1.39	56	.70
		14, 16	11.23	36,500			72	.54



## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

SNAKE RIVER BASIN  
Clearwater River at Kamiah, Idaho--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-foot)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1932	Apr.	14	10.04	28,500	5	7.80	118	0.33
	May	14	15.54	72,100			6	6.50
		21	14.44	62,200			19	2.05
	June	13-15	11.04	35,100			82	.48
1933	Apr.	27	11.13	35,800	2	19.5	79	.49
	June	4	15.43	71,200			7	.56
		10	16.53	81,400			3	13.0
1933	Dec.	23	12.19	43,600	23	1.70	48	.81
1934	Mar.	30	10.63	32,300			96	.41
	Apr.	14	11.43	37,800			63	.62
		25	12.47	45,900			39	1.00
	May	8	10.89	34,300			85	.46
1935	May	24	12.84	44,000	25	1.56	45	.87
		31	11.55	34,400			84	.46
	June	6	10.92	29,900			106	.37
1936	Apr.	19	13.68	50,600	11	3.54	34	1.15
	May	5	13.65	49,800			35	1.11
		15	15.18	63,200			17	2.29
		28	11.57	34,300			86	.45
	June	1	11.41	32,900			93	.42
1937	May	19	11.61	34,300	34	1.15	87	.45
		28	11.30	32,200			97	.40
1938	Apr.	19	15.31	63,400	10	3.90	16	2.44
	May	1	12.39	39,400			59	.66
		17	11.32	31,500			98	.40
		28	15.03	60,800			21	1.86
1939	May	4	13.30	46,400	22	1.77	38	1.03
		17	12.02	36,400			73	.53
1940	May	12	12.06	37,100	30	1.30	66	.59
		25	11.04	29,600			107	.36
1941	May	13	10.86	28,900	37	1.05	114	.34
1942	Apr.	14	10.87	28,900	31	1.26	116	.34
		21	10.92	28,900			115	.34
	May	26	12.10	37,100			67	.58
1943	Apr.	20	12.88	43,200	19	2.05	51	.76
	May	1	11.05	29,600			108	.36
		29	13.95	52,200			31	1.26
	June	11	12.08	37,100			68	.57
		19	12.90	43,200			50	.78
		22	12.51	40,100			57	.68
1944	May	16	11.78	34,200	35	1.11	88	.44
1945	May	6	13.19	44,400	24	1.63	44	.89
		31	12.44	38,400			61	.64
1946	Apr.	20	11.72	33,300	32	1.22	92	.42
		26	11.77	33,700			91	.43
	May	6	12.19	36,600			71	.55
		19	11.25	30,000			106	.37
		28	12.12	36,100			74	.53
	June	4	10.98	28,300			119	.33
1946	Dec.	15	11.80	33,900	7	5.57	89	.44
1947	May	8	16.07	69,900			9	4.33
		27	12.33	37,600			64	.61
	June	9	11.42	31,200			99	.39
1948	Apr.	18	10.97	29,400	1	39.0	112	.35
		22	11.47	32,600			94	.42
	May	8	11.64	33,800			90	.43
		22	17.84	86,500			2	19.5
		29	19.22	99,000			1	39.0
	June	22	11.31	29,600			109	.36
Period 1911-48				53,020	Mean annual			

## UMATILLA RIVER BASIN

Umatilla River near Umatilla, Oreg.

Location.- Lat. 45°54', long. 119°20', 1½ miles downstream from West Division main canal of Umatilla project and 2 miles upstream from Umatilla and mouth of river.

Drainage area.- 2,290 square miles.

Records available.- October 1903 to September 1948.

Gage.- Non-recording gage read once daily prior to Jan. 23, 1931, recording gage thereafter. Datum of gage is 330.57 feet above mean sea level, datum of 1929.

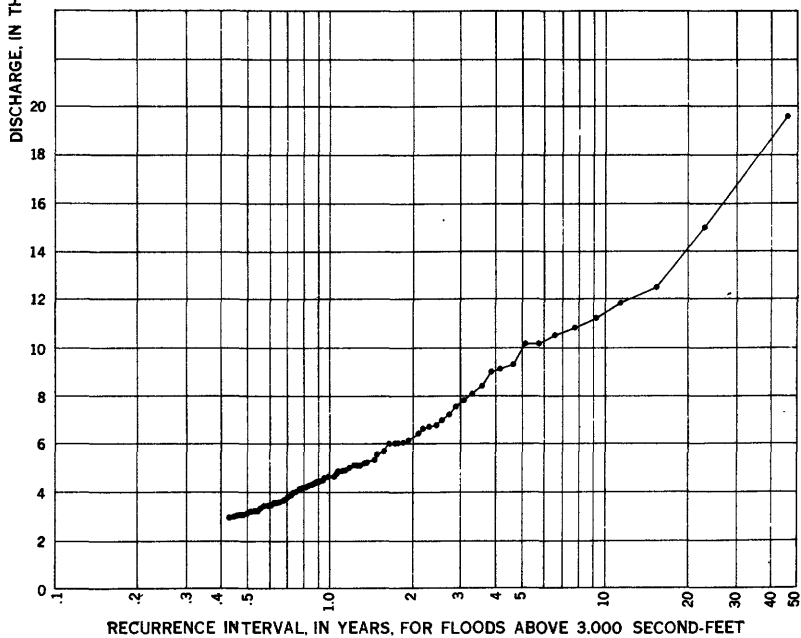
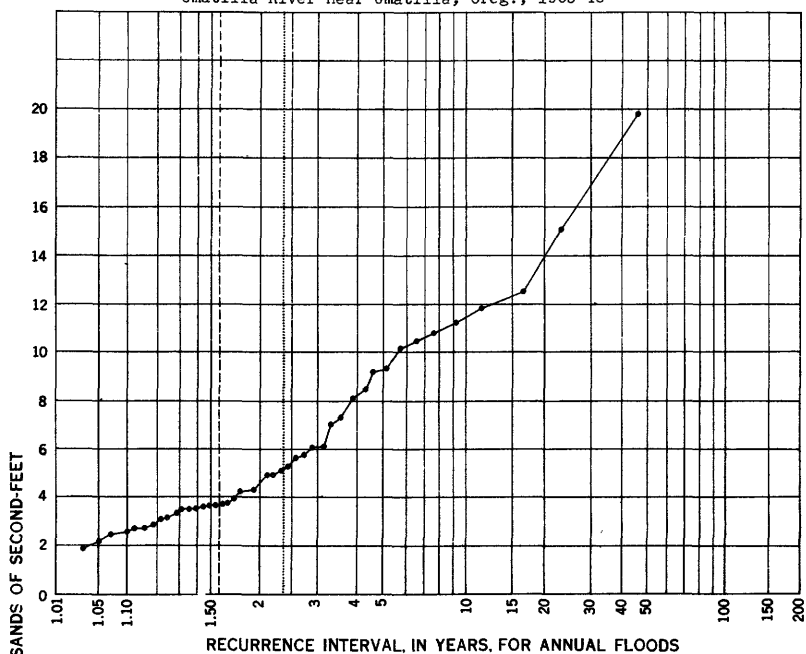
Stage-discharge relation.- Defined by current-meter measurements below 6,000 second-foot.

Maximum flood of record.- 19,600 second-foot May 31, 1906.

Remarks.- Gage heights for period when non-recording gage was used are from graphs based on gage readings. Many diversions above station for irrigation. Flow regulated by McKay and Cold Springs Reservoirs.

Year	Month	Day	Gage height (feet)	Discharge (second-foot)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1903	Nov.	22	5.2	3,180			93	0.49
1904	Mar.	9	7.6	9,010			12	3.83
		30	6.5	6,060			26	1.77
		15	7.65	9,160	10	4.60	11	4.18
1905	Mar.	28-29	4.3	1,890	45	1.02	-	-
1906	Apr.	1	5.4	3,680			69	.67
	May	31	11.0	19,600	1	46.00	1	46.00
1906	Dec.	22	6.1	5,140			36	1.28
1907	Feb.	7	6.3	5,600	18	2.56	31	1.48
		26	5.1	3,140			95	.48
		21	5.8	4,460			51	.90
		11	5.9	4,680			45	1.02
1908	Mar.	17	8.55	11,800	4	11.50	4	11.50
1909	Jan.	17	8.2	10,800	6	7.67	6	7.67
1910	Mar.	4	6.5	6,060	16	2.88	27	1.70
		21	6.5	6,060			28	1.64
1911	May	20	4.5	2,130	44	1.05	-	-
1912	Jan.	15	5.5	3,860			66	.70
	Feb.	19	5.2	3,310			84	.55
	Apr.	5	5.2	3,310			85	.54
		13-14	5.6	4,050			61	.75
	May	4	6.0	4,910	21	2.19	42	1.10
1913	Feb.	18	5.8	4,460			52	.88
	Mar.	19	5.2	3,310			86	.53
		31	7.7	9,300	9	5.11	10	4.60
	Apr.	14	6.8	6,790			19	2.42
	May	9	5.1	3,140			96	.48
1914	Feb.	25	5.05	3,040			107	.43
	Mar.	2	5.1	3,140	37	1.24	97	.47
1915	Apr.	3	4.7	2,450	43	1.07	-	-
1916	Jan.	23	5.3	3,310			87	.53
	Feb.	10	8.1	10,500	7	6.57	7	6.57
		16	5.82	4,500			50	.92
	Mar.	11	6.55	6,180			24	1.92
		21	5.78	4,420			53	.87
	May	27	5.70	4,260			57	.81
1917	Apr.	9	7.2	7,850	8	5.75	15	3.07
		27	8.0	10,200			8	5.75
	May	14	8.0	10,200			9	5.11
		31	6.1	5,140			37	1.24
1917	Dec.	29		7,000	14	3.29	18	2.56
1918	Jan.	19		3,060			104	.44
		26		4,940			41	1.12
	Mar.	27		3,140			98	.47
1919	Apr.	5		5,050	20	2.30	39	1.18
		12		3,030			108	.43
1919	Dec.	21	6.60	6,300			23	2.00
1920	Jan.	18	5.20	3,310			88	.52
		27	5.10	3,140			99	.46
	Apr.	6	6.7	6,540			22	2.09
		14	7.0	7,300	13	3.54	17	2.71

Umatilla River near Umatilla, Oreg., 1903-48



UMATILLA RIVER BASIN  
Umatilla River near Umatilla, Oreg.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1920	Dec.	31	6.8	6,790	11	4.18	20	2.30
1921	Jan.	3	7.4	8,430			13	3.54
	Feb.	11	7.1	7,570			16	2.88
	Mar.	5	5.85	4,570			49	.94
	Apr.	19	6.75	6,660			21	2.19
		23	5.05	3,050			106	.43
1921	Dec.	1		5,340	17	2.71	32	1.44
1922	Apr.	5	6.1	5,140			38	1.21
		9	6.35	5,720			29	1.59
		23	6.15	5,260			33	1.39
	May	6	5.10	3,140			100	.46
1923	Jan.	7	5.3	3,490	34	1.35	79	.58
1924	Feb.	1	5.65	4,150	26	1.77	60	.77
		9	5.7	4,250			58	.79
1925	Jan.	2	5.20	3,310	24	1.92	89	.52
	Feb.	5-6	5.75	4,360			55	.84
1926	Feb.	7	6.00	4,910	22	2.09	43	1.07
1927	Apr.	29	5.32	3,490	35	1.31	80	.58
1927	Nov.	26	5.7	4,400	19	2.42	54	.85
1928	Jan.	14	6.10	5,240			35	1.31
		31	5.04	3,120			101	.46
	Mar.	12	5.60	4,200			59	.78
	Apr.	2	5.80	4,600			48	.96
		16	5.10	3,230			91	.51
1929	Mar.	22	5.3	3,600	32	1.44	75	.61
1930	Mar.	26	4.80	2,590	42	1.10	-	-
1931	Apr.	2	9.60	15,000	2	23.00	2	23.00
1931	Dec.	18	5.22	3,180	3	15.33	94	.49
1932	Feb.	29	5.37	3,500			78	.59
	Mar.	7	6.03	5,020			40	1.15
		19	8.78	12,500			3	15.33
		26	5.62	4,020			62	.74
		29	5.51	3,810			67	.69
	Apr.	3	5.57	3,920			64	.72
		15	5.90	4,680			46	1.00
1933	May	6	5.13	3,080	38	1.21	103	.45
1934	Mar.	7	5.28	3,390	36	1.28	83	.55
1935	Apr.	17	4.93	2,740	40	1.15	-	-
1936	Mar.	2	5.12	3,020	25	1.84	109	.42
	Apr.	14	5.77	4,350			56	.82
1937	Apr.	16	5.40	3,610	30	1.53	72	.64
1938	Apr.	19	5.08	3,020	39	1.18	110	.42
1939	Mar.	23	5.88	4,640	23	2.00	47	.98
1940	Feb.	29	5.46	3,740	28	1.64	68	.68
	Mar.	2	5.43	3,670			71	.65
		28	5.20	3,210			92	.50
	Apr.	2	5.12	3,060			105	.44
1940	Nov.	30	4.94	2,720	41	1.12	-	-
1942	June	28	5.43	3,610	31	1.48	73	.63
1942	Dec.	15	5.33	3,410	29	1.59	82	.56
1943	Jan.	1	5.42	3,590			76	.61
	Feb.	5	5.18	3,110			102	.45
		14	5.43	3,610			74	.62
	Apr.	3	5.46	3,680			70	.66
1944	Mar.	11	5.57	3,910	27	1.70	65	.71
1945	Feb.	14	5.37	3,520	33	1.39	77	.60

UMATILLA RIVER BASIN  
Umatilla River near Umatilla, Oreg.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-foot)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1945	Nov.	28	5.26	3,300	12	3.83	90	0.51
	Dec.	29	7.18	8,140			14	3.29
1946	Dec.	13	8.17	11,200	5	9.20	5	9.20
1947	Jan.	27	5.25	3,460			81	.57
1948	Jan.	8	5.76	4,770	15	3.07	44	1.05
	Feb.	27	6.11	5,680			30	1.53
	Apr.	18		4,000			63	.73
	May	14	5.95	5,260			34	1.35
		23	6.26	6,080			25	1.84
Period 1903-1948				6,040	Mean annual			

k Estimated.

JOHN DAY RIVER BASIN

John Day River at McDonald Ferry, Oreg.

Location.- Lat. 45°35', long. 120°25', at McDonald Ferry, half a mile downstream from Rock Creek and 10 miles east of Klondike.

Drainage area.- 7,580 square miles.

Records available.- December 1904 to September 1948.

Gage.- Non-recording gage read once daily prior to about 1912; twice daily to Aug. 30, 1930; recording gage thereafter. Datum of gage is 392.27 feet above mean sea level, datum of 1929.

Stage-discharge relation.- Defined by current-meter measurements below 21,200 second-feet.

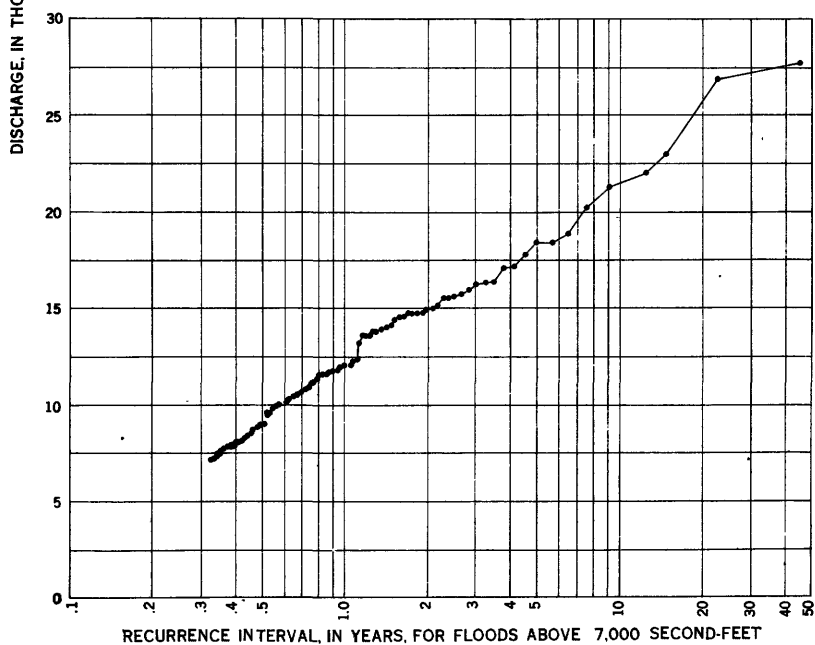
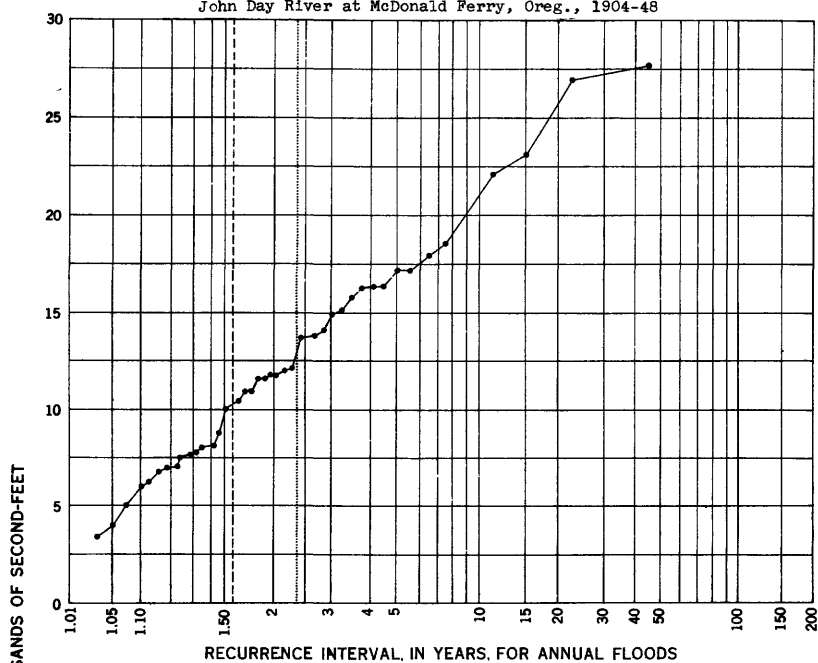
Maximum flood of record.- 27,800 second-feet (revised) Feb. 6, 1907 (gage height, 10.80 feet, from hourly gage readings).

Historical data.- Flood, probably in 1894, reached a stage of 12.8 feet (discharge, 39,100 second-feet, revised).

Remarks.- Diversions for irrigation above station.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1905	May	10	4.87	4,990	42	1.07	-	-
1906	Mar.	31	7.90	14,700	10	4.50	24	1.88
	May	30	8.30	16,300			13	3.46
1907	Feb.	2	5.70	7,180	1	45.0	135	.33
		6	10.80	27,800			1	45.0
	Mar.	21	8.80	18,400			8	5.62
	Apr.	15	7.50	13,100			40	1.12
1908	Mar.	17	7.2	12,000	21	2.14	43	1.05
	Apr.	22	5.75	7,320			134	.34
1909	Jan.	18		6,860	37	1.22	-	-
1910	Mar.	3	8.5	17,100	8	5.62	11	4.09
		21	7.95	14,900			22	2.05
1911	Mar.	24	5.8	7,470	36	1.25	130	.35
1912	Jan.	14	6.5	9,630			85	.53
		27	6.1	8,370			103	.44
	Feb.	19	6.0	8,070			108	.42
	Apr.	12	7.85	14,500			28	1.61
	May	3	7.6	13,500			37	1.22
		11	7.90	14,700			25	1.80
		31	7.92	14,800			23	1.96
1913	Apr.	2	7.1	11,700	16	2.81	49	.92
		21	7.73	14,000			31	1.45
	May	10	6.85	10,800			62	.73
	June	8	6.5	9,630			86	.52
1914	Mar.	3	5.68	7,120			138	.33
		9	6.12	8,430			101	.45
		19	6.15	8,520			100	.45
	Apr.	17	7.04	11,500			56	.80
1915	Apr.	5	5.25	5,940	41	1.10	-	-

John Day River at McDonald Ferry, Oreg., 1904-48



## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

JOHN DAY RIVER BASIN  
John Day River at McDonald Ferry, Oreg.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1916	Feb.	11	9.2	20,200	5	9.00	6	7.50
	Mar.	14	7.7	13,900			32	1.41
		21	8.1	15,500			19	2.37
	Apr.	12	7.2	12,000			44	1.02
		28	6.7	10,300			70	.64
	May	8	6.55	9,800			82	.55
		27	6.3	8,990			88	.51
1917	Apr.	9	8.9	18,800	4	11.2	7	6.43
		27	9.6	22,000			4	11.2
	May	14	9.45	21,300			5	9.00
		31	7.6	13,500			38	1.18
	June	10	6.6	9,960			75	.60
1918	Feb.	8	6.85	10,800	26	1.73	63	.71
	Mar.	27	6.3	8,990			89	.51
1919	Apr.	5	8.5	17,100	9	5.00	12	3.75
		12	6.95	11,100			59	.76
		26	6.8	10,600			65	.69
1919	Dec.	21	8.0	15,100	14	3.21	21	2.14
1920	Apr.	11	6.78	10,600			66	.68
		14	7.15	11,800			48	.94
		30	6.00	8,070			109	.41
	May	11	6.75	10,500			68	.66
1921	Jan.	1	6.0	8,070	6	7.50	110	.41
		4	6.6	9,960			76	.59
	Feb.	15	8.8	18,400			9	5.00
	Mar.	5	7.9	14,700			26	1.73
		19	7.2	12,000			45	1.00
	Apr.	4	6.3	8,990			90	.50
		13	6.6	9,960			77	.58
		24	6.7	10,300			71	.63
		30	7.25	12,200			42	1.07
	May	20	7.6	13,500			39	1.15
1921	Dec.	2	6.08	8,310	11	4.09	104	.43
1922	Mar.	25	6.05	8,220			106	.42
	Apr.	4	7.9	14,700			27	1.67
		9	8.2	15,900			16	2.81
		16	6.6	9,960			78	.58
		23	8.3	16,300			14	3.21
	May	7	7.0	11,300			58	.78
		20	8.1	15,500			20	2.25
	June	11	6.3	8,990			91	.49
1923	Jan.	8	6.25	8,840	29	1.55	93	.48
	Apr.	1	5.7	7,180			136	.33
		9	6.0	8,070			111	.41
		19	6.6	9,960			79	.57
	May	12	6.0	8,070			112	.40
1924	Feb.	9	6.71	10,300	28	1.61	72	.62
1925	Feb.	6	8.27	16,200	12	3.75	15	3.00
	Apr.	13	6.63	10,100			74	.61
	May	22	6.23	8,770			95	.47
1926	Feb.	6	5.8	7,470	33	1.36	131	.34
		8	5.95	7,920			116	.39
1927	Feb.	22	6.47	9,530	22	2.05	87	.52
	Apr.	28	7.12	11,700			50	.90
	May	18	5.68	7,120			139	.32
	June	10	7.07	11,600			53	.85
1928	Jan.	15	7.04	11,500	25	1.80	57	.79
		31	5.84	7,590			127	.35
	Mar.	24	6.69	10,300			73	.62
	Apr.	29	6.11	8,400			102	.44
	May	10	6.16	8,560			99	.45
1929	Mar.	23	5.84	7,590	35	1.29	128	.35
1930	Feb.	16	4.10	3,320	44	1.02	-	-
1931	Apr.	2	6.84	10,800	27	1.67	67	.67

JOHN DAY RIVER BASIN  
John Day River at McDonald Ferry, Oreg.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1932	Feb.	29	6.24	8,800	2	22.50	94	0.48
	Mar.	20	10.60	26,800			2	22.50
		26	7.16	11,900			47	.96
	Apr.	4	6.83	10,700			64	.70
		15	7.07	11,600			54	.83
	May	15	6.58	9,890			80	.56
1933	Apr.	5	5.92	7,830	32	1.41	120	.38
		29	5.97	7,980			115	.39
1933	Dec.	28	4.37	3,870	43	1.05	-	-
1935	Apr.	17	5.90	7,770	34	1.32	123	.37
1936	Feb.	23	5.89	7,740	30	1.50	124	.36
	Apr.	19	6.58	9,890			81	.56
1937	Apr.	3	5.90	7,770	18	2.50	122	.37
		16	7.65	13,700			35	1.29
	May	5	6.29	8,960			92	.49
1937	Dec.	13	5.99	8,040			114	.39
1938	Mar.	3	5.67	7,090	19	2.37	141	.32
		20	5.95	7,920			117	.38
	Apr.	20	7.64	13,700			36	1.25
1939	Mar.	25	7.68	13,800	17	2.65	33	1.36
1940	Mar.	1	7.28	12,300	20	2.25	41	1.10
		28	7.07	11,600			55	.82
	Apr.	2	6.54	9,760			83	.54
1941	June	9	5.32	6,120	40	1.12	-	-
1941	Dec.	21	5.89	7,740	23	1.96	125	.36
1942	Jan.	28	7.11	11,700			51	.88
	Feb.	5	5.87	7,680			126	.36
	Mar.	13	6.88	10,900			61	.74
	Apr.	15	6.94	11,100			60	.75
		11	5.83	7,560			129	.35
		17	5.95	7,920			118	.38
	May	24	5.79	7,440			132	.34
1943	Jan.	2	7.82	14,400	13	3.46	29	1.55
	Feb.	23	6.08	8,310			105	.43
	Mar.	29	8.14	15,700			17	2.65
	Apr.	17	7.68	13,800			34	1.32
	May	2	7.80	14,300			30	1.50
1944	Mar.	11	5.50	6,610	39	1.15	-	-
1945	Feb.	15	5.79	7,440	31	1.45	133	.34
	Mar.	24	5.69	7,150			137	.33
	Apr.	22	5.94	7,890			119	.38
		5	6.21	8,710			97	.46
		18	6.21	8,710			98	.46
		28	5.92	7,830			121	.37
1945	Dec.	30	8.67	17,800	7	6.43	10	4.50
1946	Mar.	1	6.23	8,770			96	.47
		14	6.04	8,190			107	.42
	Apr.	20	6.79	10,500			69	.65
		27	6.54	9,760			84	.54
	May	10	5.68	7,120			140	.32
1947	Apr.	19	5.59	6,860	38	1.18	-	-
1948	Jan.	8	8.13	15,600	3	15.0	18	2.50
	Feb.	27	6.00	8,070			113	.40
	Apr.	18	7.19	12,000			46	.98
	May	8	7.11	11,700			52	.87
		23	9.83	23,000			3	15.0
Period 1904-48				12,600	Mean annual			



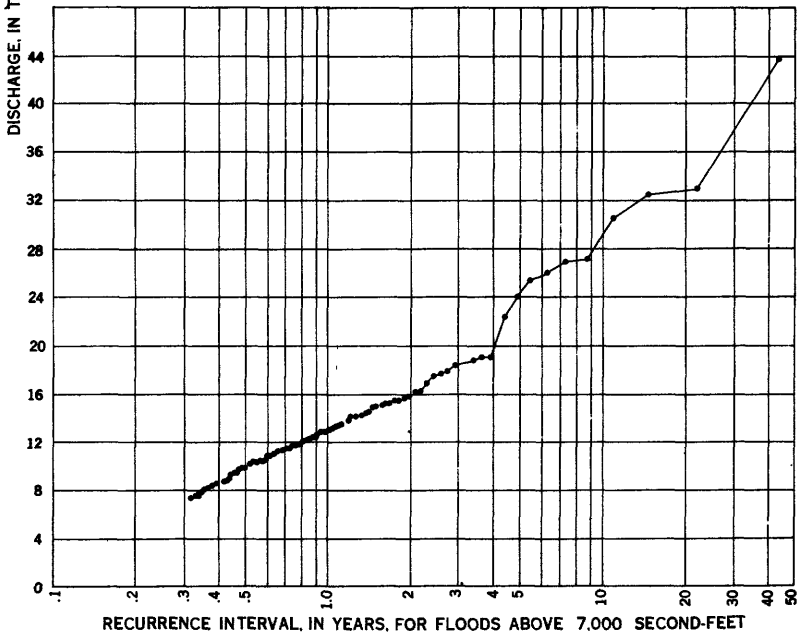
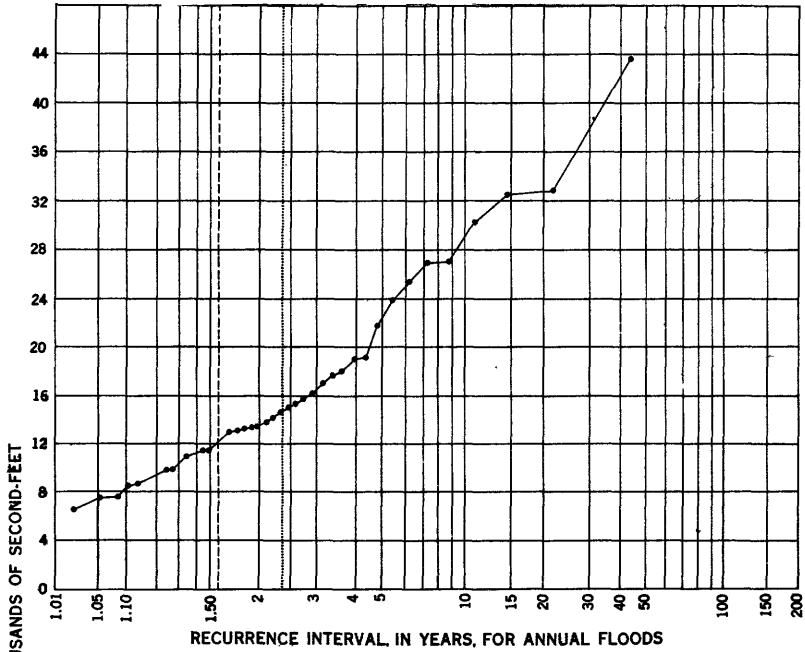
## DESCHUTES RIVER BASIN

Deschutes River at Moody, near Biggs, Oreg.

Location.- Lat. 45°37', long. 120°54', at Moody, 1½ miles upstream from mouth and 5 miles southwest of Biggs.Drainage area.- 10,500 square miles.Records available.- July 1906 to September 1948.Gage.- Non-recording gage read once daily prior to July 19, 1930, recording gage thereafter. Datum of recording gage is 167.43 feet above mean sea level, datum of 1929.Stage-discharge relation.- Defined by current-meter measurements below 19,000 second-feet.Maximum flood of record.- 43,600 second-feet Jan. 7, 1923.Remarks.- Gage heights for period when non-recording gage was used are from graphs based on gage readings. Many diversions in upper river basin for irrigation. Some winter and spring runoff stored in Crane Prairie, Wickiup, Crescent Lake, and Ochoco Reservoirs.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1906	Nov.	15	4.1	12,200			52	0.83
	Dec.	21	3.5	9,420			95	.45
1907	Feb.	6	7.5	30,600	4	10.75	4	10.75
	Mar.	22	4.75	15,500			24	1.79
	Apr.	9-13	4.5	14,200			33	1.30
1907	Dec.	27	6.0	22,200	9	4.78	10	4.30
1908	Mar.	16	4.8	15,800			22	1.95
	Apr.	19	3.65	10,100			84	.51
1909	Jan.	20	4.5	14,200	20	2.15	34	1.26
	Feb.	18	4.0	11,700			56	.77
	Mar.	30	3.7	10,300			78	.55
1909	Nov.	24	6.7	26,000			7	6.14
	Dec.	13	4.2	12,700			48	.90
1910	Jan.	25	5.3	18,400			15	2.87
	Feb.	26	4.65	15,000			29	1.48
	Mar.	2	6.85	26,900	6	7.17	6	7.17
1911	Jan.	19	3.1	7,800			125	.34
	Apr.	2	3.8	10,800	32	1.34	71	.61
1912	Jan.	14	5.2	17,900	12	3.58	16	2.69
		28-29	3.7	10,300			79	.54
	Feb.	18-19	4.7	15,200			26	1.65
	Apr.	11-13	4.0	11,700			57	.75
1912	Dec.	30	3.1	7,800			126	.34
1913	Jan.	26	3.2	8,200			119	.36
	Feb.	18	3.1	7,800			127	.34
	Apr.	14	4.4	13,700	21	2.05	38	1.13
1914	Jan.	23	3.4	8,600			107	.40
	Mar.	17-20	4.0	11,300	30	1.43	63	.68
	Apr.	17	3.9	10,800			72	.60
1915	Feb.	25	3.0	7,000			143	.30
	Apr.	4	3.7	9,850	34	1.26	88	.49
1915	Nov.	26	3.35	8,020			124	.35
	Dec.	22	3.7	9,300			97	.44
1916	Jan.	25	3.5	8,550			108	.40
	Feb.	11	7.4	27,000	5	8.60	5	8.60
	Mar.	14	4.8	14,100			35	1.23
		22	5.7	18,500			14	3.07
	Apr.	12	4.4	12,300			51	.84
	May	5-8	3.8	9,700			93	.46
	June	18-19	3.4	8,200			120	.36
1917	Mar.	31	3.5	8,550			109	.39
	Apr.	12	4.0	10,500			74	.58
		30	4.8	14,500	19	2.26	31	1.39
	May	14	4.5	13,000			43	1.00
1917	Nov.	30	3.5	8,400			113	.38
	Dec.	19	4.9	15,100			28	1.54
		29	5.3	17,500	13	3.31	18	2.39
1918	Feb.	7	4.0	10,500			75	.57
	Mar.	28	3.5	8,400			114	.38
1919	Jan.	24	3.85	9,820			89	.48
	Apr.	6	4.6	13,500	22	1.95	39	1.10
1919	Nov.	5	3.65	9,000			101	.43
	Dec.	21	4.2	11,500			58	.74
1920	Jan.	27	5.2	16,900			19	2.26
	Apr.	14-16	3.2	7,300	14	3.07	138	.31

Deschutes River at Moody, near Biggs, Oreg., 1906-48



DESCHUTES RIVER BASIN  
Deschutes River at Moody, near Biggs, Oreg.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series			
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)		
1921	Jan.	3	4.9	14,900	18	2.39	30	1.43		
	Feb.	13	4.5	12,800			45	.96		
	Mar.	6	4.15	11,000			68	.63		
		19	4.5	12,800			46	.93		
1921	Nov.	22	4.7	13,800	8	5.38	37	1.16		
1922	Dec.	1	6.6	23,900			9	4.78		
	Feb.	17	3.2	7,170			141	.30		
	Mar.	23	4.1	10,800	73	.59				
	Apr.	4	4.0	10,300			80	.54		
		25-27	4.2	11,300			64	.67		
1922	Dec.	25	3.9	9,860	1	43.00	86	.50		
1923	Jan.	7	10.2	43,600			1	43.00		
	Mar.	1-2	3.7	8,160			121	.36		
	Apr.	2-5	4.1	9,860			87	.49		
1923	Dec.	7	3.35	7,270	38	1.13	139	.31		
1924		29	3.6	8,240			118	.36		
	Feb.	1	3.7	8,660			106	.41		
1924	Nov.	22	4.0	9,800	10	4.30	90	.48		
1925	Dec.	30	3.7	8,550			110	.39		
	Feb.	6	5.95	19,000			11	3.91		
	Apr.	17	4.1	10,200	82	.52				
	May	21	4.5	12,000			54	.80		
1926	Feb.	7	4.8	13,300	24	1.79	41	1.05		
1926	Nov.	29	4.6	12,400	3	14.33	49	.88		
1927	Jan.	6	3.65	8,350			115	.37		
	Feb.	2	4.5	12,000			55	.78		
		21	8.4	32,400			3	14.33		
	Apr.	29	4.4	11,500			59	.73		
1927	Nov.	26	4.1	10,200	28	1.54	83	.42		
1928	Jan.	13	4.3	11,000			69	.62		
		30	3.75	8,760			103	.42		
	Mar.	12	4.3	11,000			70	.61		
		25	4.4	11,500			60	.72		
	May	1	3.38	7,400			135	.32		
1929	Mar.	2	3.38	7,400			41	1.05	136	.32
1930	Feb.	2	3.70	8,550			39	1.10	111	.39
1931	Apr.	1	5.26	15,700	16	2.69	23	1.87		
1932	Feb.	27	3.96	9,640	27	1.59	94	.46		
	Mar.	21-22	4.61	12,400			50	.86		
1933	Apr.	6	3.47	7,690	33	1.30	129	.33		
		29	3.44	7,580			131	.33		
	June	10	4.03	10,000			85	.51		
1933	Dec.	23	4.76	13,100	25	1.72	42	1.02		
1934	Jan.	3	3.62	8,290			117	.37		
		24	4.35	11,200			65	.66		
	Mar.	29	3.31	7,120			142	.30		
1934	Dec.	22	3.89	9,360	36	1.19	96	.45		
1935	Apr.	17	3.39	7,410			133	.32		
1936	Jan.	5	3.82	9,080	31	1.39	100	.43		
		13	3.49	7,790			128	.34		
	Feb.	27	3.99	9,760			91	.47		
	Apr.	16	4.33	11,200			66	.65		
1937	Apr.	17	4.75	13,000	26	1.65	44	.98		
	June	21	3.45	7,640			130	.33		
1937	Dec.	12	4.71	12,800	17	2.53	47	.91		
		30	4.18	10,500			76	.57		
1938	Jan.	22	4.38	11,400			62	.69		
	Mar.	3	4.51	12,100			53	.81		
		19	5.05	14,400	32	1.34				
	Apr.	21	5.19	15,200			27	1.59		
1939	Mar.	27	3.99	9,760	35	1.23	92	.47		
1940	Feb.	7	3.73	8,720	29	1.48	105	.41		
		28	4.40	11,500			61	.70		
		29	4.33	11,200			67	.64		

DESCHUTES RIVER BASIN  
Deschutes River at Moody, near Biggs, Oreg.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1941	Jan.	19	3.11	6,400	42	1.02		
1941	Dec.	20	3.39	7,410			134	0.32
1942	Feb.	5	4.82	13,400	23	1.87	40	1.08
	Mar.	14	3.57	8,100			122	.35
	Apr.	14	3.57	8,100			123	.35
1942	Dec.	2	4.98	14,100			36	1.19
1943	Jan.	1	8.48	32,900	2	21.50	2	21.50
	Feb.	7	5.90	18,700			13	3.31
		12	5.70	17,700			17	2.53
	Apr.	1	5.42	16,300			20	2.15
1944	Mar.	12	3.41	7,490	40	1.08	132	.33
1945	Feb.	14	3.74	8,760	37	1.16	104	.41
	Apr.	23	3.38	7,380			137	.31
1945	Dec.	29	7.13	25,400	7	6.14	8	5.38
1946	Jan.	25	3.76	8,840			102	.42
	Mar.	2	3.84	9,160			98	.43
	Apr.	20-21	4.17	10,500			77	.56
1946	Nov.	29	3.55	7,260			140	.31
	Dec.	15	5.41	16,200	15	2.87	21	2.05
1947	Jan.	26	3.63	8,330			116	.37
	Feb.	17	3.67	8,480			112	.38
1948	Jan.	9	5.96	19,000	11	3.91	12	3.58
	Feb.	23	5.26	15,500			25	1.72
	Apr.	23	3.66	9,240			98	.44
	May		4.13	10,300			81	.53
Period 1906-48				16,210	Mean annual			

White River below Tygh Valley, Oreg.

Location.- Lat. 45°14', long. 121°06', just below Pacific Power & Light Co.'s plant at White River Falls and  $\frac{1}{2}$  miles east of Tygh Valley.

Drainage area.- 393 square miles.

Records available.- October 1917 to September 1948.

Gage.- Recording.

Stage-discharge relation.- Defined by current-meter measurements below 5,200 second-feet.

Maximum flood of record.- 13,300 second-feet Jan. 6, 1923.

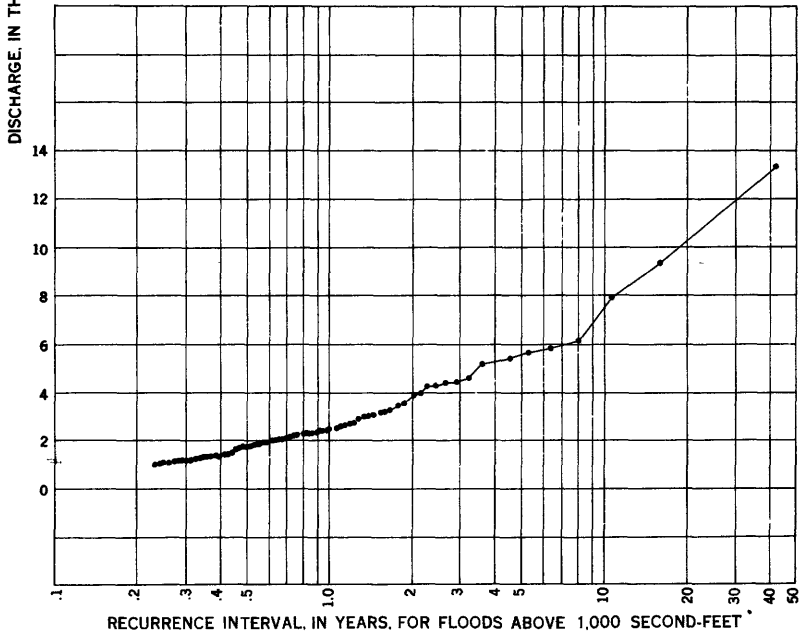
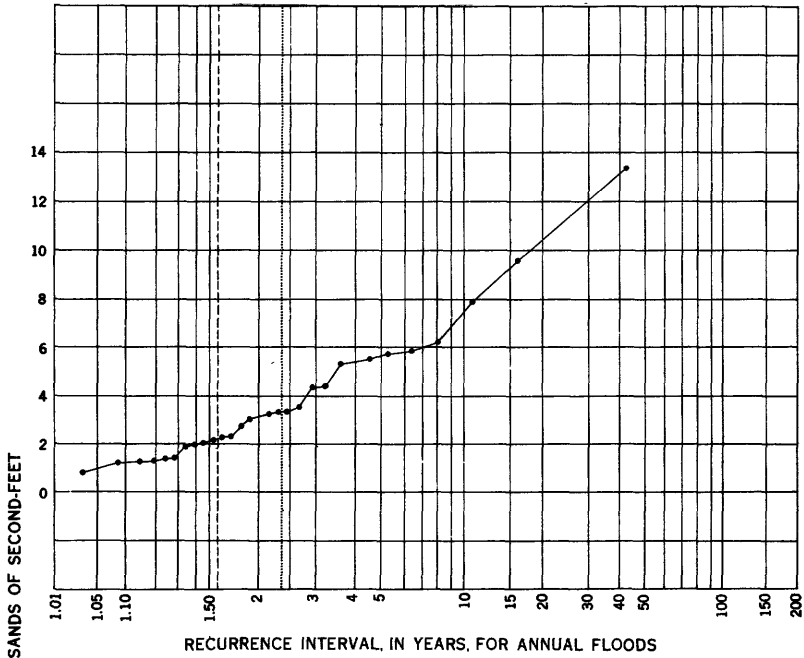
Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1917	Dec.	13	3.55	1,420			80	0.40
		19	8.00	5,700	6	5.33	6	5.33
		29	7.02	4,520			11	2.91
1918	Jan.	4	4.46	2,050			49	.65
	Feb.	7	4.18	1,820			61	.52
1919	Jan.	23	4.30	1,980	23	1.39	54	.59
	Apr.	4	3.41	1,240			102	.31
	May	1	3.58	1,450			77	.42
		28	3.33	1,270			101	.32
1919	Nov.	4	4.65	2,260			42	.76
1920	Jan.	16	5.02	2,420			33	.97
		26	5.6	3,000	17	1.88	24	1.33
	May	8	3.23	1,080			133	.24
1920	Dec.	30	4.45	1,920			56	.57
1921	Jan.	2	5.98	3,460	12	2.67	18	1.78
		5	4.98	2,410			35	.91
	Feb.	11	4.57	2,020			52	.62
	Mar.	1	3.84	1,410			83	.39
		18	4.26	1,740			67	.48
	Apr.	22	4.01	1,540			72	.44
		29	3.92	1,470			73	.44
	May	25	3.73	1,330			94	.34
	June	3	3.44	1,130			124	.26

## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

 DESCHUTES RIVER BASIN  
 White River below Tygh Valley, Oreg.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1921	Nov.	20	5.30	2,730	5	6.40	26	1.23
		30	7.80	5,820			5	6.40
	Dec.	13	4.73	2,170			45	.71
1922	May	5	3.97	1,690			70	.46
		18	4.95	2,600			29	1.10
	June	2	4.03	1,730			68	.47
1922	Dec.	24	3.57	1,370			86	.37
		31	3.66	1,440			78	.41
1923	Jan.	3	3.64	1,420	1	32.0	79	.41
		6	12.9	13,300			1	32.0
	Apr.	17	4.02	1,450			76	.42
	May	10	4.41	1,760			66	.48
1924	Feb.	5	3.70	1,220	27	1.19	104	.31
1924	Nov.	21	4.8	2,000	16	2.00	53	.60
1925	Feb.	5	5.8	3,020			23	1.39
	Apr.	16	4.07	1,410			82	.39
	May	21	4.45	1,690			69	.46
1926	Feb.	6	5.50	2,690	18	1.78	27	1.19
		24	3.73	1,170			115	.28
1926	Nov.	29	6.95	4,470	3	10.67	12	2.67
1927	Jan.	2	4.20	1,630			71	.45
		4	3.63	1,210			106	.30
	Feb.	2	4.70	2,050			48	.67
		18	5.25	2,540			30	1.07
		20	9.3	7,880			3	10.67
	Apr.	27	4.40	1,790			63	.51
		16	4.50	1,870			58	.55
1927	June	8	3.57	1,170			114	.28
1927	Nov.	25	5.91	3,230	14	2.29	20	1.60
1928	Jan.	13	4.90	2,230			43	.74
	Mar.	11	5.20	2,500			31	1.03
		24	3.75	1,300			99	.32
1929	May	24	3.55	1,160	30	1.07	118	.27
1930	Feb.	20	3.79	1,320	26	1.23	95	.34
1931	Apr.	1	10.3	9,480	2	16.00	2	16.00
1932	Jan.	12	5.0	2,120	15	2.13	47	.68
	Feb.	27	4.15	1,400			84	.38
	Mar.	19	6.0	3,120			22	1.45
	Apr.	17	3.80	1,140			122	.26
		13	4.1	1,360			89	.36
		29	3.89	1,200			110	.29
1932	Dec.	2	3.74	1,070	20	1.60	135	.24
1933	Apr.	29	4.30	1,450			75	.43
	June	9	5.12	2,220			44	.73
1933	Dec.	6	4.77	1,870	7	4.57	57	.56
1934	Jan.	22	7.9	5,450			7	4.57
		3	5.22	2,320			38	.84
		14	3.85	1,140			121	.26
		17	3.95	1,200			109	.29
		23	6.35	3,560			17	1.88
	Mar.	2	3.95	1,200			108	.30
		6	3.85	1,140			120	.27
1934	Dec.	20	7.00	4,340	10	3.20	13	2.46
1935	Jan.	21	6.00	3,220			21	1.52
		24	4.04	1,310			96	.33
	May	6	3.91	1,210			105	.30
1936	Jan.	4	4.85	2,040	22	1.45	50	.64
		10	3.88	1,190			113	.28
	Feb.	28	3.81	1,140			119	.27
	Apr.	19	4.76	1,950			55	.58
1937	Apr.	15	4.95	2,140	21	1.52	46	.70
	May	4	4.20	1,450			74	.43
	June	21	3.72	1,120			125	.26

White River below Tygh Valley, Oreg., 1917-48



## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

DESCHUTES RIVER BASIN  
White River below Tygh Valley, Oreg.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-foot)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1937	Dec.	11	3.64	1,070	13	2.46	134	0.24
1938	Jan.	30	6.03	3,250			19	1.68
		22	5.30	2,490			32	1.00
		25	3.68	1,100			129	.25
		2	3.90	1,230			103	.31
		18	4.83	2,020			51	.63
	Apr.	21	5.07	2,260			41	.78
		18	5.20	2,390			36	.89
		26	3.61	1,060			136	.24
1939	Mar.	26	3.88	1,190	28	1.14	112	.29
1940	Feb.	6	5.07	2,260	19	1.68	40	.80
	Mar.	28	4.63	1,830			59	.54
		27	3.68	1,100			128	.25
1940	Nov.	29	3.65	1,080	29	1.10	132	.24
1941	Dec.	2	4.26	1,300	24	1.33	98	.33
1942	Feb.	4	4.88	1,820			60	.53
1942	Nov.	23	5.13	2,320	8	4.00	37	.86
		27	4.00	1,300			97	.33
		29	5.71	2,900			25	1.28
1943	Dec.	9	4.05	1,340			93	.34
	Jan.	1	7.76	5,270			8	4.00
	Feb.	6	7.23	4,620			10	3.20
		11	6.68	3,970			15	2.13
	Apr.	1	4.60	1,800			62	.52
		19	5.07	2,260			39	.82
	May	26	4.57	1,770			64	.50
	June	13	3.74	1,130			123	.26
1943	Nov.	4	2.98	745	31	1.03		
1945	Feb.	13	4.07	1,350	25	1.28	91	.35
	May	4	4.08	1,360			88	.36
		16	3.78	1,160			117	.27
1945	Dec.	29	7.1	4,320	11	2.91	14	2.29
1946	Jan.	4	3.67	1,100			127	.25
		24	3.94	1,280			100	.32
		26	4.04	1,350			90	.36
	Apr.	5	4.08	1,360			85	.38
		20	4.03	1,340			92	.35
	May	27	4.05	1,360			87	.37
	1946	Dec.	15	8.6			6,120	4
1947	Jan.	26	5.26	2,410	4	8.00	34	.94
	Feb.	2	4.13	1,410			81	.40
		16	3.81	1,190			111	.29
1947	Nov.	8	3.63	1,080	9	3.56	131	.24
		15	3.67	1,100			126	.25
1948	Jan.	7	7.90	5,250			9	3.56
	Feb.	15	3.83	1,200			107	.30
		22	6.72	3,900			16	2.00
		26	4.55	1,760			65	.49
		23	3.64	1,080			130	.25
	Apr.	26	5.50	2,650			28	1.14
	May	12	3.76	1,160			116	.28
	June	16	3.56	1,040			137	.23
Period 1918-48				. 3,720	Mean annual			

k Estimated.

r From graph based on gage readings.

## KLICKITAT RIVER BASIN

Klickitat River near Glenwood, Wash.

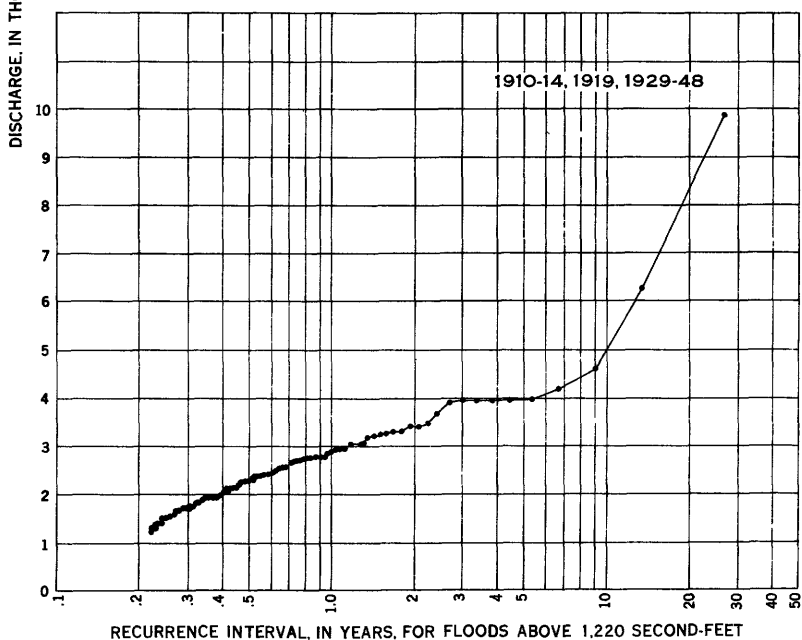
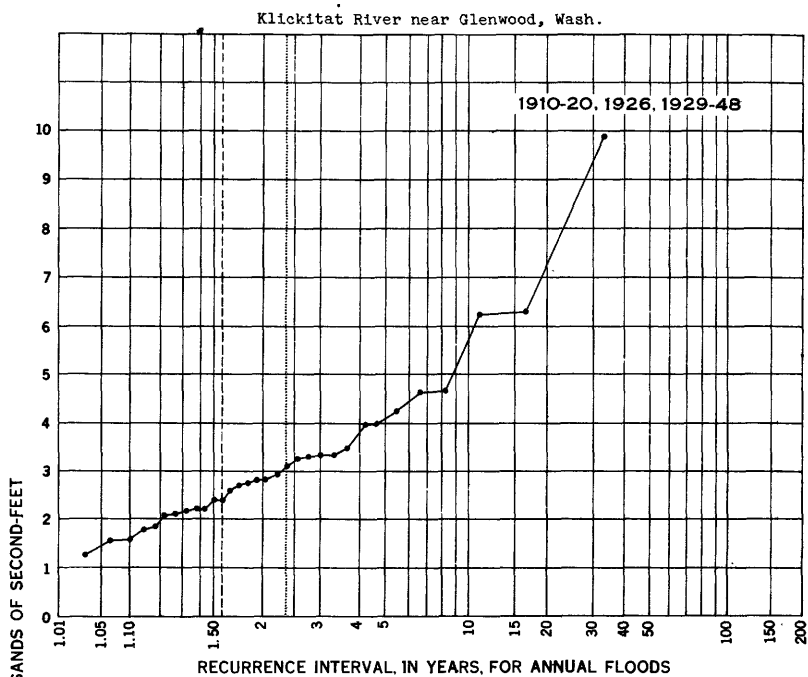
Location.- Lat. 46°05'30", long. 121°15'30", half a mile downstream from Dairy Creek,

5 miles north of Glenwood, and 7 miles upstream from Trout Creek.

Drainage area.- 360 square miles.Records available.- December 1910 to September 1948 (1915-18, 1920-28 fragmentary or partly estimated). October 1909 to December 1910 at site 1 mile upstream.Gage.- Non-recording gage read once daily prior to July 19, 1910; recording gage thereafter. Datum of gage is about 1,703 feet above mean sea level, datum of 1929, since July 1934.Stage discharge relation.- Defined by current-meter measurements below 3,000 second-feet.Maximum flood of record.- 9,870 second-feet Dec. 22, 1933.Remarks.- Some diversion for irrigation during spring and summer. No regulation. Peak discharges prior to July 19, 1910, based on one gage reading per day; time of reading not known.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1909	Nov.	3	3.10	2,100	2	16.5	64	0.42
		24	5.20	6,250			2	13.5
		30	3.40	3,700			11	2.46
1910	Dec.	12	2.00	1,720			90	.30
		25	2.40	2,280			54	.50
	Mar.	3	2.45	2,350			51	.53
		20-22	3.25	3,490			12	2.25
	Apr.	25	3.20	3,410			13	2.08
		10	3.15	3,340			15	1.80
	May	24	2.40	2,280			55	.49
1910	Nov.	10	1.84	1,720			91	.30
		21	1.67	1,510			108	.25
1911	Apr.	2	1.62	1,250			122	.22
		25	2.02	1,750			88	.31
	May	4	2.14	1,920			77	.35
		18	2.15	1,940			74	.36
	June	1-2	2.68	2,910		15	26	1.04
		13	2.58	2,740			33	.82
1912	Apr.	10	1.72	1,320		1.94	118	.23
	May	14-15	2.87	2,790			29	.93
	June	2-8	2.45	2,150			60	.45
1913	Apr.	26	2.10	1,690		3.30	96	.28
	May	10	2.72	2,320			52	.52
		27	3.21	3,100			21	1.28
	June	3	3.33	3,310			16	1.69
		23	2.45	2,150			61	.44
1914	Jan.	7	2.93	2,890		2.06	27	1.00
	Mar.	23	1.99	1,430			113	.24
	Apr.	15	2.92	2,770			32	.84
		20	2.85	2,660			38	.71
	May	3	2.78	2,550			41	.66
		15	2.95	2,820			28	.96
	June	17	1.98	1,380			116	.23
1915	Apr.	3	2.62	2,200	23	1.44	-	-
1916	June	18	3.47	4,620	4	8.25	-	-
1917	June	9	2.90	3,300	11	3.00	-	-
1917	Dec.	-	4.2	6,200	3	11.0	-	-
1919	Jan.	18	3.04	2,480		6.60	43	.63
		23	4.26	4,600			3	9.00
	Apr.	4	2.34	1,510			109	.25
	May	1	2.98	2,400			47	.57
		27	3.33	2,790			30	.90
	June	20	2.40	1,420			114	.24
	May	17	2.58	1,810	28	1.18	-	-
1926	Apr.	18	2.99	1,750	29	1.14	-	-





Klickitat River BASIN  
Klickitat River near Glenwood, Wash.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1929	May	3	2.69	1,460			111	0.24
		24	3.80	2,560			40	.68
		15	3.11	1,840	20	1.65	84	.32
1930	Feb. Apr. May	20	2.72	1,460			112	.24
		23	2.93	1,520	31	1.06	107	.25
		16-17	2.63	1,280			120	.22
1931	Mar. May	31	3.27	1,740			89	.30
		2	3.77	2,200	24	1.38	58	.46
		14	3.31	1,790			86	.31
1932	Feb. Mar. Apr. May June	27	3.34	1,890			79	.34
		19	2.99	1,540			103	.26
		17	3.00	1,540			104	.26
		-	4.09	2,700	18	1.83	35	.77
		13	3.39	1,940			75	.36
1932	Nov.	13	3.25	1,760			87	.31
		17	3.94	2,710			34	.79
1933	Apr. June	29	3.99	2,780			31	.87
		9	4.76	3,950			8	3.38
		15	4.77	3,950	8	4.12	7	3.86
1933	Nov. Dec.	3	2.88	1,400			115	.24
		10	4.82	3,950			9	3.00
		22	6.90	9,870	1	33.0	1	27.0
1934	Jan. Mar. Apr.	23	3.70	3,980			5	5.40
		6	1.86	1,880			80	.34
		29	2.51	2,570			39	.69
		23	1.95	1,980			70	.39
1934	Oct. Nov. Dec.	25	2.58	1,640			99	.27
		6	3.62	2,680	19	1.74	37	.73
		21	2.75	1,620			100	.27
1935	May	23	3.47	2,300			53	.51
1936	Apr. May June	23	3.49	2,360			50	.54
		4	3.78	2,700			36	.75
		14	4.08	3,070	14	2.36	22	1.23
		28	3.72	2,250			57	.47
		7	3.84	2,420			44	.61
1937	Apr. May June	14	3.32	1,850			83	.33
		4	3.46	1,860			82	.33
		26	3.69	2,110			63	.43
		3	3.86	2,280			56	.48
		21	3.96	2,390	21	1.57	48	.56
1937	Dec.	30	3.44	1,600			101	.27
1938	Jan. Apr. May June	14	3.10	1,280			121	.22
		18	4.65	2,940			24	1.12
		1	4.86	3,260			20	1.35
		16	4.90	3,960			18	1.50
		27	5.43	2,040	7	4.71	6	4.50
		22	4.17	2,140			67	.40
1939	May	16	4.26	1,880	25	1.32	62	.44
		29	4.09				81	.33
1939	Dec.	-	3.70	1,290			119	.23
1940	Mar. May	30	4.36	1,720			92	.29
		10-11	4.65	2,040	27	1.22	68	.40
1941	Apr. May	1-2	4.18	1,540	30	1.10	105	.26
		1	3.90	1,240			123	.22
		17	4.19	1,540			106	.25
1942	Dec. Apr. May	3	4.71	2,070	26	1.27	65	.42
		20	4.60	1,960			71	.38
		13	4.64	1,660			97	.28
		22	4.79	1,820			85	.32
		9	4.50	1,490			110	.25
1943	Nov. Mar. Apr. May June	23	4.98	2,050			66	.41
		23	4.90	1,930			76	.36
		29	4.70	1,710			93	.29
		19	5.71	2,930			25	1.08
		25	5.96	3,280	12	2.75	17	1.59
		10	5.40	2,540			42	.64
1944	May	18	5.31	2,410			46	.59
		8	4.23	1,220	32	1.03	124	.22

Klickitat River Basin  
Klickitat River near Glenwood, Wash.--Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1945	Feb.	8	4.68	1,710	22	1.50	94	0.29
	May	4 or 5	5.41	2,380			49	.55
		31	5.02	1,910			78	.35
1946	Apr.	26	5.27	2,200	13	2.54	59	.46
	May	19	6.05	3,210			19	1.42
1946	Nov.	18	5.20	m1,990	9	3.67	69	.39
	Dec.	14	6.32	m3,410			14	1.93
1947	Apr.	20	4.52	m1,660			98	.28
	May	8	5.29	m2,420			45	.60
		28	4.80	m1,710	6	5.50	95	.28
	June	-8	4.66	m1,560			102	.26
1947	Oct.	20	5.08	m1,950			73	.37
1948	Apr.	23	4.45	m1,370			117	.23
	May	26	7.00	m4,200			4	6.75
	June	11	5.90	m3,920			10	2.70
		16	5.43	m3,040			23	1.17
Period 1910-20, 1926, 1929-48				3,220	Mean annual			

m Provisional, subject to revision.

COWLITZ RIVER BASIN

Cowlitz River at Castle Rock, Wash.

Location.- Lat. 46°16'30", long. 122°55'00", at highway bridge in Castle Rock, 2½ miles downstream from Toutle River and 14 miles upstream from mouth.

Drainage area.- 2,240 square miles.

Records available.- December 1926 to September 1948.

Gage.- Staff gage read twice daily Dec. 10, 1926, to Dec. 10, 1933. Wire-weight gage read once or twice daily Dec. 29, 1933, to June 14, 1934. Recording gage thereafter.

Datum of recording gage, 19.73 feet above mean sea level, datum of 1929.

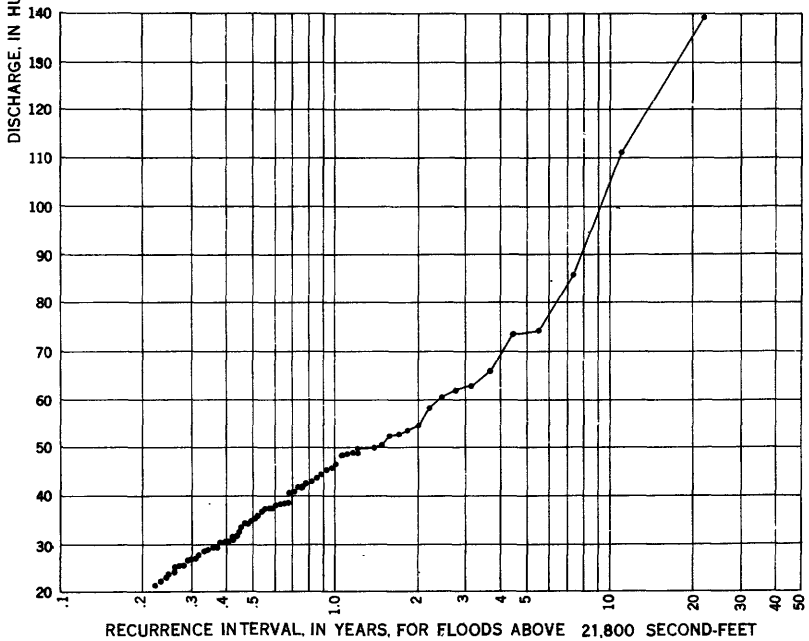
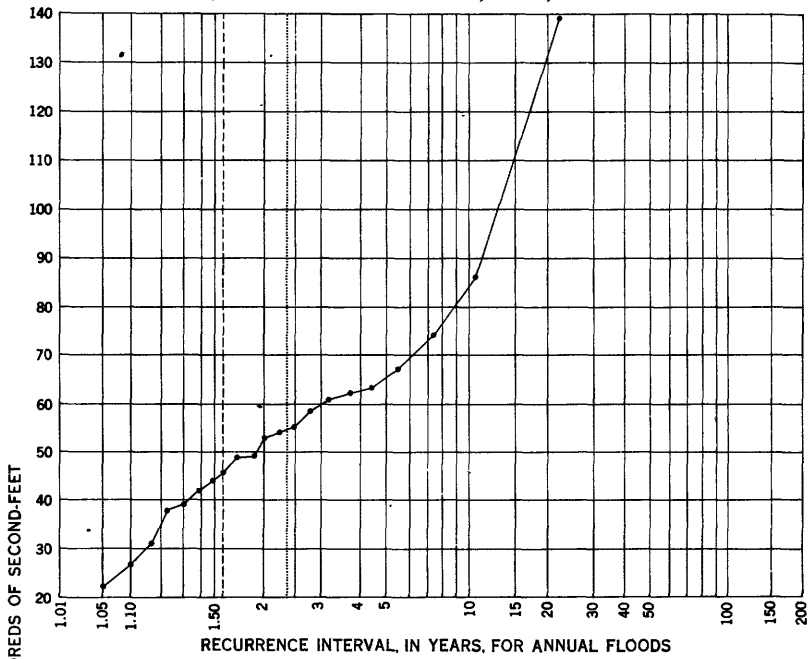
Stage-discharge relation.- Defined by current-meter measurements below 79,300 second-feet.

Maximum flood of record.- 139,000 second-feet Dec. 23, 1933.

Remarks.- Gage-heights for period when non-recording gage was used are from graph based on gage readings. No diversion or regulation.

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1927	Oct.	4	9.55	36,800	3	7.33	41	0.54
	Nov.	25	13.95	74,000			4	5.50
1928	Jan.	4	9.20	33,700			48	.45
		13	10.80	46,400			22	1.00
	Mar.	11	8.07	26,000			76	.29
		31	9.05	32,300	21	1.05	50	.44
	May	1	7.85	23,900			86	.26
1929	May	25	7.31	21,800			100	.22
1930	Feb.	8	8.80	30,900	19	1.16	53	.42
		14	7.96	25,300			81	.27
		20	8.60	29,500			60	.37
1931	Jan.	24	7.92	24,600	4	5.50	83	.26
		29	7.50	21,800			101	.22
	Feb.	19	8.06	26,000			77	.29
	Apr.	1	13.15	66,800			6	3.67
1931	Dec.	18	8.20	26,700	11	2.00	72	.31
1932	Jan.	12	8.92	31,600			51	.43
		18	8.50	28,800			64	.34
	Feb.	27	11.30	50,400			15	1.47
	Mar.	6	11.63	52,800			13	1.69
		19	9.28	34,400			46	.48
	Apr.	19	7.60	22,500			96	.23

Cowlitz River at Castle Rock, Wash., 1928-48



## FLOODS OF MAY-JUNE 1948 IN COLUMBIA RIVER BASIN

COWLITZ RIVER BASIN  
Cowlitz River at Castle Rock, Wash.---Continued

Year	Month	Day	Gage height (feet)	Discharge (second-feet)	Annual floods		Partial duration series	
					Order (M)	Recurrence interval (years)	Order (M)	Recurrence interval (years)
1932	Nov.	6	8.58	29,500	10	2.20	61	0.36
		14	11.70	53,600			12	1.63
	Dec.	3	10.70	45,600			23	.96
1933	Jan.	2	7.58	22,500	95		14	1.57
		9	11.60	52,800			42	.52
	June	9	9.52	36,000				
1933	Oct.	24	7.60	22,500	1	22.0	94	.23
	Nov.	3	10.28	42,400			28	.78
	Dec.	10	23.0	111,000			2	11.0
1934	Jan.	23	26.6	139,000	5		1	22.0
		23	17.63	73,100			5	4.40
	Mar.	3	9.42	25,500			79	.28
1934	Oct.	30	8.72	22,300	6	3.67	98	.22
		26	18.33	48,800			18	1.22
	Nov.	6	20.39	61,800			8	2.75
1935	Dec.	23	17.26	42,800	27		27	.81
		6	14.06	25,400			80	.27
	Jan.	22	18.48	50,000			16	1.38
1936	Jan.	4	16.75	40,700	13	1.69	31	.71
		12	18.12	48,200			21	1.05
	Feb.	27	15.42	33,300			49	.45
1936	May	5	13.61	24,500	102		84	.26
		16	12.96	21,800			45	.22
	June	8	15.74	34,800				.49
1936	Dec.	23	16.85	40,700	12	1.83	32	.69
		15	18.24	48,800			19	1.16
	June	21-22	14.54	28,800			65	.34
1937	Nov.	9	14.77	30,500	5	4.40	57	.39
		14	14.02	26,800			70	.31
	Dec.	25	16.19	37,600			37	.59
1938	Dec.	18	13.36	23,600	7		89	.25
		30	20.38	62,900			7	3.14
	Jan.	15	15.82	35,700			43	.51
1938	Apr.	18	17.43	44,300	15	1.47	25	.88
		5	13.23	23,000			93	.24
	Jan.	3	14.79	30,600			55	.40
1939	Feb.	12	15.77	35,400	16	1.38	44	.50
		15	17.31	43,600			26	.85
	Dec.	16	17.00	41,900			29	.76
1940	Feb.	7	16.19	37,600	20	1.10	38	.58
		29	13.32	23,400			91	.24
	Nov.	29	14.07	26,400			74	.30
1941	Jan.	18	13.16	22,200	8	2.75	99	.22
		15	14.00	26,100			75	.29
	Dec.	3	14.43	28,200			67	.33
1942	Nov.	20	19.74	58,100	7	3.14	10	2.20
		15	13.48	23,700			88	.25
	Dec.	24	20.10	60,500			9	2.44
1943	Jan.	1	13.61	23,200	14	1.57	92	.24
		6	15.01	30,400			58	.38
	Feb.	11	14.00	25,200			82	.27
1943	Mar.	28	17.07	41,800	18	1.22	30	.73
		4	15.24	37,100			40	.55
	Dec.	4	15.24	37,100				
1945	Jan.	8	15.05	30,600	14	1.57	56	.39
		14	15.16	31,200			52	.42
	Feb.	8	17.67	45,500			24	.92
1945	May	4	13.43	22,400	9	2.44	97	.23
		27	14.63	26,800			71	.31
	Dec.	29	19.91	54,700			11	2.00
1946	Jan.	5	17.07	38,400	24		35	.63
		24	14.36	25,600			78	.28
	Feb.	2	13.95	23,800			87	.25
1946	Feb.	6	14.60	26,600	85		73	.30
		27	14.00	24,000				
							85	.26

COWLITZ RIVER BASIN  
Cowlitz River at Castle Rock, Wash.--Continued

Year	Month	Day	Gage height ( <i>foot</i> .)	Discharge ( <i>second-foot</i> )	Annual floods		Partial duration series		
					Order (M)	Recurrence interval ( <i>years</i> )	Order (M)	Recurrence interval ( <i>years</i> )	
1946	Nov.	19	18.89	48,500	2	11.0	20	1.10	
		28	15.02	28,500			66	.33	
		5	14.89	28,000			68	.32	
1947	Jan.	15	24.47	85,600			3	7.33	
		26	19.36	m50,000			17	1.29	
		2	16.83	m34,300			47	.47	
1947	Feb.	15	15.10	m27,700			69	.32	
		Oct.	20	17.18			m38,600	17	1.30
		Nov.	8	17.16			m39,500	33	.67
1948	Dec.	19	14.20	m23,500			34	.65	
		Jan.	2	15.36			m28,900	90	.24
	Feb.	7	17.08	m38,100	63	.35			
		Mar.	26	16.91	m37,200	36	.61		
	May	22	15.70	m30,700	39	.56			
		7	15.44	m29,300	54	.41			
		28	15.56	m29,900	62	.35			
					59	.37			
Period 1928-48				54,880	Mean annual				

m Provisional, subject to revision.

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# INDEX

	Page		Page
Abstracts.....	1, 317	Butter Creek near Pine City, Oreg....	255
Acknowledgments.....	4, 318	Calder, Idaho, St. Joe River at.....	139,403-406
Administration of the work.....	3-4, 318	Camas Creek near Ukiah, Oreg.....	263
Ahsahka, Idaho, North Fork Clear-		Camas Reservoirs, Mont.....	88
water River near.....	239	Canal Flats, British Columbia,	
Ahtanum Creek, North Fork, near		Kootenay River at.....	55
Tampico, Wash.....	426-428	Canby, Oreg., Molalla River near.....	272
South Fork, at Conrad Ranch, near		Cape Horn, Idaho, Bear Valley Creek	
Tampico, Wash.....	164	near.....	211
Alturas Lake Creek near Obsidian,		Middle Fork Salmon River near.....	210
Idaho.....	205	Carson, Wash., Wind River near.....	269
American River near Nile, Wash.....	179	Castle Rock, Wash., Cowlitz River	
Analysis, methods.....	326-327	at.....	276,466-469
Annual-flood method.....	328	Cataldo, Idaho, Coeur d'Alene River	
comparison with partial-duration-		near.....	397-400
series method.....	329-330	Catherine Creek near Union, Oreg....	224
Ariel, Wash., Lewis River at.....	275	Cathlamet, Wash., Elokomon River	
Ashley Creek near Kalispell, Mont....	123	near.....	277
Asotin Creek near Asotin, Wash.....	230	Cazadero, Oreg., Clackamas River near	274
Asotin Creek Basin, Wash., gaging-		Challis, Idaho, Challis Creek near...	208
station records in.....	230	Salmon River near.....	200
Astoria, Oreg., Youngs River near....	277	Challis Creek near Challis, Idaho....	208
Aurora, Oreg., Pudding River near....	273	Characteristics of floods in Columbia	
Bear Creek (tributary to Bitterroot		River Basin.....	322-326
River) near Victor, Mont.....	109	Chelan, Wash., Chelan River at.....	151
Bear Creek (tributary to Middle Fork		Lake Chelan at.....	150
Flathead River) near Essex, Mont....	118	Chelan River at Chelan, Wash.....	151
Bear Creek (tributary to Wallowa		Chelan River Basin, Wash., flood	
River) near Wallowa, Oreg.....	229	magnitude and frequencies in.....	415-422
Bear Valley Creek near Cape Horn,		gaging-station records in.....	149-152
Idaho.....	211	Chiwawa River near Plain, Wash.....	156
Belton, Mont., Middle Fork Flathead		Clackamas River near Cazadero, Oreg....	274
River at.....	378-380	Clark Fork, Mont., flood scenes....	82,pl.10
Middle Fork Flathead River near....	117	Clark Fork above Missoula, Mont.....	78,360-362
Big Creek near Big Creek, Idaho.....	212	at St. Regis, Mont.....	81,364-367
Big Fork, Mont., Swan River near....	385-387	at Tarkio, Mont.....	80
Biggs, Oreg., Deschutes River		below Missoula, Mont.....	362-364
near.....	266,456-459	near Heron, Mont.....	83
Birch Creek at Rieth, Oreg.....	254	near Plains, Mont.....	82,368-369
Birchbank, British Columbia,		Clarkston, Wash., Snake River	
Columbia River at.....	48	near.....	187-188,428-431
Bitterroot River, East Fork, at		Clayton, Idaho, Salmon River	
Conner, Mont.....	105	near.....	199,437-439
near Darby, Mont.....	104	Yankee Fork Salmon River near.....	207
West Fork, near Conner, Mont.....	103	Clearwater River at Kamiah,	
Bitterroot River (West Fork) Reser-		Idaho.....	233-234,445-448,pl.12,A
voir near Conner, Mont.....	87	at Spalding, Idaho.....	234
Blackfoot River near Bonner, Mont....	100	North Fork, at Bungalow ranger	
near Helmsville, Mont.....	98	station, Idaho.....	238
near Ovando, Mont.....	99	near Ahsahka, Idaho.....	239
Blodgett Creek near Corvallis,		South Fork, near Elk City, Idaho....	236
Mont.....	107-108	near Grangeville, Idaho.....	237
Blue Creek near Walla Walla, Wash....	244	Clearwater River Basin, Idaho, gag-	
Blue Lake near Coulee City, Wash....	162	ing-station records in.....	231-240
Boise River, South Fork, near Lenox,		Cle Elum, Wash., Teanaway River near.	175
Idaho.....	431-434	Yakima River at.....	165
Bonner, Mont., Blackfoot River near..	100	Cle Elum Lake near Roslyn, Wash.....	172
Bonnors Ferry, Idaho, flood scene.63,pl.9,A		Cle Elum River near Roslyn, Wash.....	173-174
Kootenai River at.....	61-62,344-346	Coeur d'Alene Lake at Coeur d'Alene,	
Kootenai River near.....	60,63,64	Idaho.....	135
Boom Camp, near Bonnors Ferry, Idaho,		Coeur d'Alene River at Enaville,	
Kootenai River at.....	60	Idaho.....	133
Boulder Creek (Kootenai River Basin)		near Cataldo, Idaho.....	134,397-400
near Leonia, Idaho.....	70,346-349	near Pritchard, Idaho.....	132
Boulder Creek (Pend Oreille River		Columbia Falls, Mont., Flathead River	
Basin) at Maxville, Mont.....	95	at.....	113,374-376
Boundary Creek near Porthill, Idaho.76,357-359		Flathead River near.....	372-374
Bull Run, Oreg., Sandy River near....	269	South Fork Flathead River near....	381-383
Bull Run River near Bull Run, Oreg.,		Columbia River at Birchbank, British	
Sandy River below.....	269	Columbia.....	48
Bumping Lake near Nile, Wash.....	177	at Grand Coulee Dam, Wash.....	51-52
Bumping River near Nile, Wash.....	178	at international boundary.....	49
Bungalow ranger station, Idaho, North		at Kettle Falls, Wash.....	335-336
Fork Clearwater River at.....	238	at Nicholson, British Columbia....	46
Burgdorf, Idaho, Secesh River near...	217	at Revelstoke, British Columbia....	47
Burnt Fork Creek near Stevensville,		at Trinidad, Wash.....	53
Mont.....	110	near international boundary, stage	
Burnt River near Hereford, Oreg.....	190	relations.....	315-316
Burnt River Basin, Oreg., gaging-		near The Dalles, Oreg.....	54,336-338
station records in.....	190	Columbia River Basin, characteristics	
		of floods.....	322-326



	Page		Page
Columbia River Basin, magnitude and frequency of floods.....	317-469	Enveloping curve.....	331-333
physical features.....	318-322	Ephrata, Wash., Rocky Ford Creek near	161
Columbia River main stem, British Columbia-Wash.-Oreg., gaging-station records on.....	46-54	Error, probable, of flood-frequency graph.....	330-331
flood magnitude and frequencies on.....	335-338	Essex, Mont., Bear Creek near.....	118
Colville, Wash., Mill Creek near.....	131	Middle Fork Flathead River at.....	116
Colville River at Kettle Falls, Wash.....	130,394-397	Skyland Creek near.....	119
Colville River Basin, Wash., flood magnitude and frequencies in.....	394-397	Ferry, Wash., Kettle River near.....	128,389-391
gaging-station records in.....	130-131	Finn, Mont., Nevada Creek above reservoir, near.....	101
Como Lake near Darby, Mont.....	87	Nevada Creek Reservoir near.....	87
Comparison of annual-flood and partial-duration-series methods.....	329-330	Flathead, British Columbia, Flathead River at.....	111
Conner, Mont., East Fork Bitterroot River at.....	105	Flathead Lake at Somers, Mont.....	114
West Fork Bitterroot River near.....	103	Flathead River at Columbia Falls, Mont.....	113,374-376
West Fork Bitterroot River Reservoir near.....	87	at Flathead, British Columbia.....	111
Conrad Ranch, near Tappan, Wash., South Fork Ahtanum Creek at.....	164	Middle Fork, at Belton, Mont.....	378-380
Coolin, Idaho, Priest Lake near.....	125	at Essex, Mont.....	116
Priest River near.....	387-389	near Belton, Mont.....	117
Copeland, Idaho, Kootenai River near.....	65	near Columbia Falls, Mont.....	112,372-374
Corvallis, Mont., Blodgett Creek near.....	107-108	near Polson, Mont.....	115,377-378
Coulee City, Wash., Blue Lake near.....	162	South Fork, near Columbia Falls, Mont.....	120,381-383
Park Creek near.....	161	Flint Creek at Maxville, Mont.....	91
Park Lake near.....	162	near Drummond, Mont.....	92
Cowlitz River at Castle Rock, Wash.....	276,466-469	near Maxville, Mont.....	92
Cowlitz River Basin, Wash., flood magnitude and frequencies in.....	466-469	near Southern Cross, Mont.....	90
gaging-station records in.....	276	Flood crest stages.....	306-315
Crab Creek at Irby, Wash.....	158	Flood damage.....	13-15
near Moses Lake, Wash.....	159	Flood determinations, map of location of.....	in pocket, pl.6
near Smyrna, Wash.....	160	Flood discharges, determination of.....	37
near Warden, Wash.....	159	summary of.....	278-305
Crab Creek Basin, Wash., gaging-station records in.....	158-162	Flood-frequency graph, probable error.....	330-331
Crescent Valley, British Columbia, Slokan River at.....	77	Flood magnitude and frequencies.....	333-469
Crest stages, flood.....	306-315	Flood stages, summary of.....	278-305
Crow Reservoir (Lower), Mont.....	89	Floods, characteristics of, in Columbia River Basin.....	322-326
Curve, enveloping.....	331-333	general description of.....	5-12
Dale, Oreg., North Fork John Day River near.....	261	magnitude and frequency of, in Columbia River Basin.....	317-469
Damage, flood.....	13-15	Fortine Creek near Trego, Mont.....	68
Darby, Mont., Bitterroot River near.....	104	Fox Creek at gorge, near Fox, Oreg....	265
Como Lake near.....	87	Franklin D. Roosevelt Lake at Grand Coulee Dam, Wash.....	50
Rock Creek near.....	106	French Creek, Idaho, Salmon River near.....	203
Rock Creek Canal near.....	106	Frequencies, flood.....	333-469
Dartford, Wash., Little Spokane River near.....	143	Frequency of floods in Columbia River Basin.....	317-469
Data, explanation of.....	39-45	Garrison Creek at Walla Walla, Wash..	245
Dayton, Wash., East Fork Touchet River near.....	246	Georgetown Lake near Southern Cross, Mont.....	86
Dayville, Oreg., John Day River near.....	257	Gibbon, Oreg., Umatilla River above Meacham Creek near.....	248
Deep Creek at Moravia, Idaho.....	73,352-354	Glenwood, Wash., Klickitat River near.....	463-466
Deschutes River at Moody, near Biggs, Oreg.....	266,456-459	Grand Coulee Dam, Wash., Columbia River at.....	51-52
Deschutes River Basin, Oreg., flood magnitude and frequencies in.....	456-462	Franklin D. Roosevelt Lake at.....	50
gaging-station records in.....	266	Grande Ronde River at La Grande, Oreg.	221
Discharge, records of.....	46-277	at lower end of State ditch, Oreg.....	54,pl.7,B
Discharges, determination of flood.....	37	at Rondowa, Oreg.....	222,442-445
summary of flood.....	278-305	at Troy, Oreg.....	223
Drewry, Oreg., Malheur River near.....	435-437	near Hilgard, Oreg.....	220
Drummond, Mont., Flint Creek near.....	92	Grande Ronde River Basin, Oreg., gaging-station records in.....	220-229
Dry Fork Reservoir, Mont.....	88	Grangeville, Idaho, South Fork Clearwater River near.....	237
Dry Fork Reservoir (Upper), Mont.....	88	Gumboot Creek, Oreg., Imnaha River above.....	195
Easton, Wash., Kachess Lake near.....	169	Haines, Oreg., Powder River near.....	192
Kachess River near.....	170-171	Hall, Mont., Willow Creek near.....	96
Eastport, Idaho, Moyie River at.....	71	Hayden Creek near Hayden Lake, Idaho.	141
Eileen, Idaho, Moyie River at.....	349-351	Hayden Lake at Hayden Lake, Idaho.....	141
Elk City, Idaho, South Fork Clearwater River near.....	236	Heisson, Wash., East Fork Lewis River near.....	275
Elokomin River near Cathlamet, Wash..	277	Helmville, Mont., Blackfoot River near.....	98
Elokomin River Basin, Wash., gaging-station records in.....	277	Nevada Creek near.....	102
Enaville, Idaho, Coeur d'Alene River at.....	133	Hereford, Oreg., Burnt River near.....	190
Entiat River, Wash., flood scene.....	148,pl.11,B	Heron, Mont., Clark Fork near.....	83
		Hilgard, Oreg., Grande Ronde River near.....	220

	Page		Page
Hood River near Hood River, Oreg.....	267	Kootenai River at Porthill, Idaho....	66
Hood River Basin, Oreg., gaging- station records in.....	267	flood scenes.....	62, pl. 8
Hope, Idaho, Pend Oreille Lake at....	84	near Bonners Ferry, Idaho.....	63
Hubbart Reservoir, Mont.....	88	near Copeland, Idaho.....	65
Hurricane Creek near Joseph, Oreg.....	227	Kootenai River Basin, British Columbia-Idaho-Mont., flood magnitude and frequencies in.....	338-359
Hydrologic conditions.....	15-37	gaging-station records in.....	55-77
Icicle Creek above Snow Creek, near Leavenworth, Wash.....	157	Kootenay Lake at Kuskonook, British Columbia.....	67
Imbler, Oreg., Indian Creek near.....	225	Kootenay River at Canal Flats, British Columbia.....	55
Imnaha River above Gumboot Creek, Oreg.....	195	at Newgate, British Columbia.....	57
at Imnaha, Oreg.....	196	at Wardner, British Columbia.....	56
Imnaha River Basin, Oreg., gaging- station records in.....	195-196	Kuskonook, British Columbia, Kootenay Lake at.....	67
Indian Creek near Imbler, Oreg.....	225	La Grande, Oreg., Grande Ronde River at.....	221
International boundary, Columbia River at.....	49	Lake Chelan at Chelan, Wash.....	150
Columbia River near, stage relations.....	315-316	Lake Creek near Troy, Mont.....	69
Introductions.....	1-3, 317-318	Landmark ranger station, Idaho, John- son Creek near.....	214
Irby, Wash., Crab Creek at.....	158	Latah Creek at Spokane, Wash.....	142
Italian Creek, near Kalama, Wash., Kalama River below.....	276	Laurier, Wash., Kettle River near.....	129, 392-394
John Day River at McDonald Ferry, Oreg.....	452-455	Leavenworth, Wash., Icicle Creek near.....	157
at Picture Gorge, near Dayville, Oreg.....	257	Lenore Lake near Soap Lake, Wash.....	162
at Prairie City, Oreg.....	256	Lenox, Idaho, South Fork Boise River near.....	431-434
at Service Creek, Oreg.....	258	Leonia, Idaho, Boulder Creek near.....	346-349
Middle Fork, at Ritter, Oreg.....	264	Kootenai River at.....	342-344
North Fork, at Monument, Oreg.....	262	Lewis River at Arlet, Wash.....	275
near Dale, Oreg.....	261	East Fork, near Heisson, Wash.....	275
John Day River Basin, Oreg., flood magnitude and frequencies in.....	452-455	Lewis River Basin, Wash., gaging- station records in.....	275
gaging-station records in.....	256-265	Libby, Mont., Kootenai River at.....	58, 338-341
Johnson Creek (Salmon River Basin) at Yellow Pine, Idaho.....	215, 216	Little Bitterroot Lake, Mont.....	88
Johnson Creek (Willamette River Basin) at Sycamore, Oreg.....	274	Little Spokane River near Davenport, Wash.....	143
near Landmark ranger station, Idaho Joseph, Oreg., East Fork Wallowa River near.....	214	Little White Salmon River at Willard, Wash.....	268
Hurricane Creek near.....	226	Little White Salmon River Basin, Wash., gaging-station records in.....	268
Wallowa Falls power-plant tailrace near.....	227	Lochsa River near Lowell, Idaho.....	235
Kachess Lake near Easton, Wash.....	169	Long Canyon Creek near Porthill, Idaho.....	63, 74, pl. 9, B
Kachess River near Easton, Wash.....	170-171	Long Lake, Wash., Spokane River at.....	138
Kalama, Wash., Kalama River near.....	276	Lostine River near Lostine, Oreg.....	228
Kalama River below Italian Creek, near Kalama, Wash.....	276	Lotus, Idaho, St. Maries River at.....	140
Kalama River Basin, Wash., gaging- station records in.....	276	Lowell, Idaho, Lochsa River near.....	235
Kallispell, Mont., Ashley Creek near.....	123	Selway River near.....	231, 232
Whitefish Creek near.....	383-384	Lower Jocko Lake, Mont.....	89
Kamiah, Idaho, Clearwater River at.....	233-234, 445-446, pl. 12, A	Lucerne, Wash., Railroad Creek at.....	152, 419-422
Keechelus Lake near Martin, Wash.....	163	McDonald Ferry, Oreg., John Day River at.....	259, 452-455
Kendrick, Idaho, Potlatch Creek at....	240	McDonald Reservoir, Mont.....	89
Kettle Falls, Wash., Columbia River at.....	335-336	McKay Creek near Pendleton, Oreg.....	253
Colville River at.....	334-397	near Pilot Rock, Oreg.....	252
Kettle River near Ferry, Wash.....	129, 389-391	McNary dam site.....	54, pl. 7, A
near Laurier, Wash.....	129, 392-394	Magnitude and frequencies, flood.....	333-469
Kettle River Basin, Wash., flood magnitude and frequencies in.....	389-394	Magnitude and frequency of floods in Columbia River Basin.....	317-469
gaging-station records in.....	128-129	Malheur River near Drewsey, Oreg.....	435-437
Kicking Horse Reservoir, Mont.....	89	Martin, Wash., Keechelus Lake near.....	163
Kiona, Wash., Yakima River at.....	168	Yakima River near.....	164
Klickitat River near Glenwood, Wash.....	463-466	Maxville, Mont., Boulder Creek at.....	95
near Pitt, Wash.....	267	Plint Creek at.....	91
Klickitat River Basin, Wash., flood magnitude and frequencies in.....	463-466	Plint Creek near.....	92
gaging-station records in.....	267	Meacham Creek, near Gibbon, Oreg., Umatilla River above.....	248
Klockman Ranch, near Bonners Ferry, Idaho, Kootenai River at.....	64	Meadow Creek, near Lowell, Idaho, Selway River above.....	231
Knox, Idaho, South Fork Salmon River near.....	213	Metaline Falls, Wash., Pend Oreille River below Z Canyon, near.....	85, 370-371
Kootenai River at Bonners Ferry, Idaho.....	61-62, 344-346	Meteorologic and hydrologic conditions.....	15-37
at Boom Camp, near Bonners Ferry, Idaho.....	60	Meteorology.....	15-21
at Klockman Ranch, near Bonners Ferry, Idaho.....	64	Method, annual-flood.....	328
at Leonia, Idaho.....	59, 342-344	partial-duration-series.....	328-329
at Libby, Mont.....	58, 338-341	Methods of analysis.....	326-327
		Methow River at Twisp, Wash.....	148, 413-415
		near Carlton, Wash.....	148, pl. 11, A
		Methow River Basin, Wash., flood magnitude and frequencies in.....	413-415
		gaging-station records in.....	148
		Mill Creek (Colville River Basin) near Colville, Wash.....	131

	Page		Page
Mill Creek (Walla Walla River Basin)		Philipsburg, Mont., Middle Fork Rock	
at Walla Walla, Wash.....	244	Creek near.....	97
near Walla Walla, Wash.....	243	Trout Creek above main canal, near..	93
Mill Creek (Willamette River Basin)		Physical features of Columbia River	
at Salem, Oreg.....	271	Basin.....	318-322
Milton, Oreg., North Fork Walla Walla		Picture Gorge, near Dayville, Oreg.,	
River near.....	242	John Day River at.....	257
South Fork Walla Walla River near..	241	Pike, Oreg., North Yamhill River near	272
Mission Reservoir, Mont.....	89	Pilot Rock, Oreg., McKay Creek near..	252
Mission Valley Reservoir, Mont.....	88-89	Pine City, Oreg., Butter Creek near..	255
Missoula, Mont., Clark Fork above.....	78,360-362	Pitt, Wash., Klickitat River near....	267
Clark Fork below.....	79,362-364	Plain, Wash., Chlawa River near.....	156
Molalla River near Canby, Oreg.....	272	Wenatchee Lake near.....	152
Monument, Oreg., North Fork John Day		Wenatchee River at.....	154,422-425
River at.....	262	Plains, Mont., Clark Fork near....	82,368-369
Moody, near Biggs, Oreg., Deschutes		Plotting positions.....	327-328
River at.....	268,456-459	Polson, Mont., Flathead River	
Moravia, Idaho, Deep Creek at.....	73,352-354	near.....	115,377-378
Moses Lake, Wash., Crab Creek near...	159	Porthill, Idaho, Boundary Creek	
Moses Lake at.....	162	near.....	76,357-359
Moses Lake at Moses Lake, Wash.....	162	Kootenai River at.....	66
Moyle River at Eastport, Idaho.....	71	Long Canyon Creek near.....	63,74,p.1.9.B
at Eileen, Idaho.....	72,349-351	Smith Creek near.....	75,354-356
Mud Creek near Tamarack, Idaho.....	219	Portland, Oreg., flood scenes.....	10,p.1.3
Naches, Wash., Tieton Reservoir near.		Willamette River at.....	270-271
Tieton River near.....	176,181,182	Positions, plotting.....	327-328
Naches River below Tieton River,		Post Falls, Idaho, Spokane River at..	136,401
near Naches, Wash.....	176	Potlatch Creek at Kendrick, Idaho....	240
Nevada Creek above reservoir, near		Powder River at Salisburg, Oreg.....	191
Finn, Mont.....	101	near Haines, Oreg.....	192
near Helmsville, Mont.....	102	near Robinette, Oreg.....	193
Nevada Creek Reservoir near Finn, Mont.		Powder River Basin, Oreg., gaging	
Newgate, British Columbia, Kootenay		station records in.....	191-194
River at.....	57	Prairie City, Oreg., John Day River	
Nicholson, British Columbia, Columbia		at.....	256
River at.....	46	Strawberry Creek above Slide Creek,	
Nighthawk, Wash., Similkameen River		near.....	260
near.....	147,409-412	Precipitation.....	21-35
Nile, Wash., American River near....	179	1894 and 1948.....	26,p.1.5
Bumping Lake near.....	177	Prichard, Idaho, Coeur d'Alene River	
Bumping River near.....	178	near.....	132
Ninepipe Reservoir, Mont.....	89	Priest Lake at outlet, near Coolin,	
North Powder, Oreg., Wolf Creek near.	194	Idaho.....	125
North Yamhill River near Pike, Oreg..	272	Priest River at outlet of Priest Lake,	
Obsidian, Idaho, Alturas Lake Creek		near Coolin, Idaho.....	126,387-389
near.....	205	near Priest River, Idaho.....	127
Salmon River near.....	197	Probable error of flood-frequency	
Okanogan River at Oroville, Wash.....	145	graph.....	330-331
near Tonasket, Wash.....	146,407-409	Pudding River near Aurora, Oreg.....	273
Okanogan River Basin, Wash., flood		Railroad Creek at Lucerne, Wash.....	152,419-422
magnitude and frequencies		References, list.....	469
in.....	407-412	Revelstoke, British Columbia,	
gaging-station records in.....	144-147	Columbia River at.....	47
Oroville, Wash., Okanogan River at...	145	Rieth, Oreg., Birch Creek at.....	254
Osoyoos Lake near.....	144	Ritter, Oreg., Middle Fork John Day	
Osoyoos Lake near Oroville, Wash....	144	River at.....	264
Ovando, Mont., Blackfoot River near..	99	Robinette, Oreg., Powder River near..	193
Oxbow, Oreg., Snake River at.....	186	Rock Creek, Middle Fork, near Philips-	
Pablo Reservoir, Mont.....	88-89	burg, Mont.....	97
Panther Creek near Shoup, Idaho.....	209	near Darby, Mont.....	106
Park Creek below Park Lake, near		Rock Creek Canal near Darby, Mont....	106
Coulee City, Wash.....	161	Rock Creek (East Fork) Reservoir near	
Park Lake near Coulee City, Wash....	162	Philipsburg, Mont.....	86
near Coulee City, Wash., Park Creek		Rocky Ford Creek near Ephrata, Wash..	161
below.....	161	Rondawa, Oreg., Grande Ronde River	
Parker, Wash., Yakima River near.....	167	at.....	222,442-445
Partial-duration-series method.....	328-329	Roslyn, Wash., Cle Elum Lake near....	172
comparison with annual-flood		Cle Elum River near.....	173-174
method.....	329-330	St. Joe River at Calder, Utah.....	139,403-406
Payette, Idaho, Payette River near...	189	St. Maries River at Lotus, Idaho.....	140
Payette River near Payette, Idaho....	189	St. Regis, Mont., Clark Fork at.....	81,364-367
Payette River Basin, Idaho, gaging-		Salem, Oreg., Mill Creek at.....	271
station records in.....	189	Willamette River at.....	270
Pendleton, Oreg., McKay Creek near...	253	Salisbury, Oreg., Powder River at....	191
Umatilla River at.....	249	Salmon River at Salmon, Idaho.....	201
Pend Oreille Lake at Hope, Idaho.....	84	at Whitebird, Idaho.....	204,440-442
Pend Oreille River below Z Canyon,		below Valley Creek, at Stanley,	
near Metaline Falls, Wash.....	85,370-371	Idaho.....	198
Pend Oreille River Basin, Idaho-		below Yankee Fork, near Clayton,	
Mont.-Wash., flood magnitude		Idaho.....	199,437-439
and frequencies in.....	360-369	Middle Fork, near Cape Horn, Idaho.	210
gaging-station records in.....	78-127	near Challis, Idaho.....	200
smaller reservoirs in.....	86	near French Creek, Idaho.....	203
Personnel.....	3-4	near Obsidian, Idaho.....	197
Peshastin, Wash., Wenatchee River at.	155	near Shoup, Idaho.....	202
Philipsburg, Mont., East Fork Rock		South Fork, near Knox, Idaho.....	213
Creek Reservoir near.....	86	Yankee Fork, near Clayton, Idaho....	207

	Page		Page
Salmon River Basin, Idaho, gaging-station records in.....	197-219	Tieton Dam, near Naches, Wash.,	
Sandy River below Bull Run River, near Bull Run, Oreg.....	269	Tieton River at.....	181
Sandy River Basin, Oreg., gaging-station records in.....	269	Tieton Reservoir near Naches, Wash...	180
Sauvies Island in Columbia River, flood scene.....	16,pl.4,A	Tieton River at headworks of Tieton Canal, near Naches, Wash.....	182
Secesh River near Burgdorf, Idaho....	217	at Tieton Dam, near Naches, Wash., near Naches, Wash., Naches River below.....	181
Selway River above Meadow Creek, near Lowell, Idaho.....	231	below.....	176
Service Creek, Oreg., John Day River at.....	258	Tonasket, Wash., Okanogan River near.....	146,407-409
Shoup, Idaho, Panther Creek near....	209	Touchet, Wash., Touchet River near...	247
Salmon River near.....	202	Touchet River, East Fork, near Dayton, Wash.....	246
Similkameen River near Nighthawk, Wash.....	147,409-412	near Touchet, Wash.....	247
Skyland Creek near Essex, Mont.....	119	Trego, Mont., Fortine Creek near....	68
Slide Creek, near Prairie City, Oreg., Strawberry Creek above.....	260	Trinidad, Wash., Columbia River at...	53
Slocan River at Crescent Valley, British Columbia.....	77	Trout Creek above main canal, near Philipsburg, Mont.....	93
Smith Creek near Porthill, Idaho.75,354-356		near Southern Cross, Mont.....	94
Smyrna, Wash., Crab Creek near.....	160	Troy, Mont., Lake Creek near.....	69
Snake River at Oxbow, Oreg.....	186	Troy, Oreg., Grande Ronde River at...	223
at Weiser, Idaho.....	185	Tualatin River near Willamette, Oreg.....	273
near Clarkston, Wash.....	187-188,428-431	Twain Reservoir, Mont.....	88-89
Snake River Basin, Idaho-Oreg.-Wash., flood magnitude and frequencies in.....	428-448	Twisp, Wash., Methow River at...148,413-415	
gaging-station records in.....	185-240	Tygh Valley, Oreg., White River below.....	459-462
Snake River main stem, Idaho-Oreg.-Wash., gaging-station records on.....	185-188	Ukiah, Oreg., Camas Creek near.....	263
Snow Creek near Leavenworth, Wash., Icicle Creek above.....	157	Umatilla, Oreg., Umatilla River near.....	251,449-452
Soap Lake, Wash., Lenore Lake near....	162	Umatilla River above Meacham Creek, near Gibbon, Oreg.....	248
Soap Lake near.....	162	at Pendleton, Oreg.....	249
Soap Lake near Soap Lake, Wash.....	162	at Yoakum, Oreg.....	250
Somers, Mont., Flathead Lake at....	114	near Umatilla, Oreg.....	251,449-452
South Yamhill River near Whiteson, Oreg.....	271	Umatilla River Basin, Oreg., flood magnitude and frequencies in.....	449-452
Southern Cross, Mont., Flint Creek near.....	90	gaging-station records in.....	248-255
Georgetown Lake near.....	86	Umtanum, Wash., Yakima River at.....	166
Trout Creek near.....	9	Underwood, Wash., White Salmon River near.....	268
Spalding, Idaho, Clearwater River at.	234	Union, Oreg., Catherine Creek near...	224
Spokane, Wash., Latah Creek at.....	142	Valley Creek at Stanley, Idaho.....	206
Spokane River at.....	137-138,402-403	at Stanley, Idaho, Salmon River below.....	198
Spokane River at Long Lake, Wash.....	138	Vancouver, Wash., flood scene.....	16,pl.4,B
at Post Falls, Idaho.....	136,401	Vanport, Oreg., flood scenes.....	2-3,pl.1,2
at Spokane, Wash.....	137-138,402-403	Victor, Mont., Bear Creek near.....	109
Spokane River Basin, Idaho-Wash., flood magnitude and frequencies in.....	397-406	Walla Walla, Wash., Blue Creek near..	244
gaging-station records in.....	132-143	Garrison Creek at.....	245
Stage, records of.....	46-277	Mill Creek at.....	244
Stage relations, Columbia River near international boundary.....	315-316	Mill Creek near.....	243
Stages, flood crest.....	306-315	Yellowhawk Creek at.....	245
summary of flood.....	278-305	Walla Walla River, North Fork, near Milton, Oreg.....	242
Stanley, Idaho, Salmon River at.....	198	South Fork, near Milton, Oreg.....	241
Valley Creek at.....	206	Walla Walla River Basin, Oreg.-Wash., gaging-station records in.....	241-247
State ditch.....	54,pl.7,B	Wallowa, Oreg., Bear Creek near.....	229
Stehakin River at Stehakin, Wash.....	149,415-419	Wallowa Falls power-plant tailrace near Joseph, Oreg.....	226
Stevensville, Mont., Burnt Fork Creek near.....	110	Wallowa River, East Fork, near Joseph, Oreg.....	226
Stillwater River near Whitefish, Mont.....	121	Warden, Wash., Crab Creek near.....	159
Strawberry Creek above Slide Creek, near Prairie City, Oreg.....	260	Wardner, British Columbia, Kootenay River at.....	56
Swan River near Big Fork, Mont..124,385-387		Warren Creek near Warren, Idaho.....	218
Sycamore, Oreg., Johnson Creek at....	274	Washougal River near Washougal, Wash.	270
Tabor Reservoir, Mont.....	89	Washougal River Basin, Wash., gaging-station records in.....	270
Tamarack, Idaho, Mud Creek near.....	219	Weiser, Idaho, Snake River at.....	185
Tampico, Wash., North Fork Ahtanum Creek near.....	183,426-428	Wenatchee Lake, Wash., Wenatchee River below.....	153
South Fork Ahtanum Creek near.....	164	Wenatchee Lake near Plain, Wash....	152
Tarkio, Mont., Clark Fork at.....	80	Wenatchee River at Peshastin, Wash..	155
Teanaway River near Cle Elum, Wash...	175	at Plain, Wash.....	154,422-425
Temperature.....	37	below Wenatchee Lake, Wash.....	153
The Dalles, Oreg., Columbia River near.....	54,336-338	Wenatchee River Basin, Wash., flood magnitude and frequencies in.....	422-425
Tieton Canal, near Naches, Wash., Tieton River at headworks of...	182	gaging-station records in.....	152-157
		Whitebird, Idaho, Salmon River at.....	204,440-442
		Whitebird Creek near.....	234,pl.12,B
		Whitebird Creek near Whitebird, Idaho.....	234,pl.12,B

	Page		Page
Whitefish, Mont., Stillwater River		Yakima River at Cle Elum, Wash.....	165
near.....	121	at Kiona, Wash.....	168
Whitefish Creek near Kalispell,		at Umtanum, Wash.....	166
Mont.....	122,383-384	near Martin, Wash.....	164
White River below Tygh Valley, Oreg.	459-462	near Parker, Wash.....	167
White Salmon River near Underwood,		Yakima River Basin, Wash., flood	
Wash.....	268	magnitude and frequencies in..	426-428
White Salmon River Basin, Wash.,		gaging-station records in.....	163-184
gaging-station records in.....	268	Yankee Fork, near Clayton, Idaho,	
Whiteson, Oreg., South Yamhill River		Salmon River below.....	43,199
near.....	271	Yankee Fork Salmon River near	
Willamette, Oreg., Tualatin River		Clayton, Idaho.....	2C7
near.....	273	Yellow Pine, Idaho, Johnson Creek	
Willamette River at Portland, Oreg.	270-271	at.....	215-216
at Salem, Oreg.....	270	Yellowhawk Creek at Walla Walla,	
Willamette River Basin, Oreg., gaging-		Wash.....	245
station records in.....	270-274	Yoakum, Oreg., Umatilla River at.....	250
Willard, Wash., Little White Salmon		Youngs River near Astoria, Oreg.....	277
River at.....	268	Youngs River Basin, Oreg., gaging-	
Willow Creek near Hall, Mont.....	96	station records in.....	277
Wind River near Carson, Wash.....	269	Z Canyon, near Metaline Falls, Wash.,	
Wind River Basin, Wash., gaging-		Pend Oreille River below...85,370-371	
station records in.....	269		
Wolf Creek near North Powder, Oreg...	194		

